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SCIENCE AND TECHNOLOGY

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CHINA REPORT

SCIENCE AND TECHNOLOGY

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NATIONAL DEVELOPMENTS

RISE, DEVELOPMENT OF SCIENTIFIC, TECHNICAL MARKETS DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 1, 12 Jan 85 pp 2-5

[Article by Ma Xiliang [7456 1585 5328]: "Scientific and Technical Markets Play a Vital Role in Scientific Progress and Economic Prosperity"]

[Text] In the face of China's rapidly growing socialist commodity production and commodity exchanges, a brand-new market -- the scientific and technical market -- is also taking shape and developing robustly. It is a new and dynamic phenomenon on China's scientific and technical front in the 1980's and will certainly play a crucial role in promoting technical progress and economic prosperity in the country.

The Rise of the Scientific and Technical Market and Its Characteristics

China's scientific and technical market has gone through the following developmental stages:

Stage 1, the birth of the market. The decision by the party and government to let scientific and technical achievements be bought and sold for a fee took the unique commodity, science and technology, into the arena of China's socialist commodity production and commodity exchanges. At the beginning, the main transactions in the scientific and technical market involved scientific research units and production units spontaneously contacting and cooperating with one another. The former made over to the latter its research results, provided technical services and undertook design and manufacturing jobs commissioned by the latter.

Stage 2, the formative stage. During this period, the scientific and technical market became less spontaneous and informal and more structured and formalized. As leadership emerged and the market came under more effective planning, it also shed some of its old haphazard quality. It grew in scope and scale and permanent organizations appeared together with scheduled exchange gatherings. The major manifestations and characteristics of the scientific and technical market during this stage include:

(1) the organization of various "scientific and technical exchange and trade fairs." These fairs were the primary sign of the development of China's

scientific and technical market and constituted its most significant organizational embodiment. They brought together institutions of higher education, scientific research units, design units and production units; facilitated their face-to-face contacts when they could discuss scientific and technical cooperation; and promoted mutual understanding so that agreements could be reached and contracts signed more quickly.

(2) the publication of newspapers and magazines, eg., the "Technical Market" and "Technical Consulting." Tianjin's "Technical Market," Anhui's "Technical Consulting" and assorted columns on technical market and technical consulting in various newspapers together make up an important component of the scientific and technical market. As willing "matchmakers," they take the initiative to "marry" scientific research with production. Both parties warmly welcome them for the important function they fulfill by acting as a vehicle of information in scientific and technical exchange and trade.

(3) the establishment of scientific and technical consulting organizations. A nationwide scientific and technical consulting system has taken shape rudimentarily. It has as its core the Chinese Scientific and Technical Association and is buttressed by an array of scientific and technical consultancies in other organizations. A new development in the new historic era, the consulting system puts an end to the exclusive concentration by academic units on academic exchanges and the separation between scientific research units and production. With the establishment of the consulting system, scientific and technical work has happily taken a step towards becoming more oriented to production and economic development.

(4) the establishment of scientific and technical exchange service centers. As permanent organizations for the exchange and trade in science and technology these centers to various extents have regularized and systematized such transactions, paving the way for the rapid development of the scientific and technical market.

Stage 3, the present stage of rapid development. Its main characteristics are:

(1) the scientific and technical market has become "commercialized." In Tianjin, the regular scientific and technical market operated by the "Science and Technology Development Service Center" has been referred to as "a scientific and technical store," becoming the first such store in the country. "Scientific and technical stores" routinize scientific and technical exchange and trade, provide a permanent venue for such transactions and constitute a further development of and improvement upon the scientific and technical exchange and trade fair. Since they are in business all year round, they facilitate the timely popularization of the latest achievements and provide a quick solution for any technical problem that may arise in a production unit. Less than 10 days after it opened for business, Tianjin's scientific and technical store clinched 495 deals with a total value of 3.48 million yuan.

(2) scientific and technical knowledge has been transformed into a "commodity." Influenced by the world's new technological revolution, scientific and technical knowledge has also become a commodity and entered the realm of exchange. Computer software companies and computer firms are

springing up all over the country. As a result, software has become an intellectual product, an important part of the scientific and technical trade. The Xian Computer Software Company, which is responsible for turning software into a commodity, did over 200,000 yuan worth of business within a month after it was established.

(3) the scientific and technical market has been "diversified." Scientific and technical markets can be found at provincial, municipal and autonomous regional levels, in addition to those run by large, medium-sized and small cities. Some markets are government-operated, others by private organizations. Some are collectively owned by the whole people, others are collectively or individually owned. One after another, some scientific and technical workers and peasants have been setting up on their own individually run scientific and technical service companies and spare-time research institutions. This is also another sign of the rapid growth taking place in our scientific and technical market.

(4) the development of a "network" of scientific and technical services. A network is gradually taking shape linking together scientific and technical services throughout the nation. Its creation and development further strengthen the coordination of and guidance for the scientific and technical market and steer it forward in the proper direction.

The Main Functions of the Scientific and Technical Market

The functions of the scientific and technical market are a function of science and technology as productive forces. The scientific and technical market, in turn, is conducive to making science and technology function more effectively as productive forces. More specifically, the functions of the scientific and technical market are:

1. to popularize the application of scientific and technical achievements and new technology and solve production problems.

This is effected through scientific and technical exchange and trade fairs, scientific and technical stores, scientific and technical development service companies and so on. Hangzhou, Zhejiang Province, called a 25-day provincial scientific and technical exchange fair in April and May 1982, which proved very successful in popularizing achievements and solving production problems. According to incomplete data, it generated 5.26 million yuan worth of business and will boost annual output value by 127.19 million yuan and increase annual profits by 29.15 million yuan when the contracts signed during the fair materialize. Almost one third of the contracts were completed within 3 months after the fair closed. At the "new technology exchange talks" sponsored by the Shanghai Municipal Science and Technology Commission last April, 2,271 scientific and technical achievements and problems were on display and its volume of business amounted to 18.76 million yuan. Letters of intent for over 700 projects were signed at the recently concluded scientific and technical cooperation conference on the five provinces and regions in the northwest, the first of its kind in the nation. When the letters of intent are translated into fact, total annual agricultural and industrial output value in the northwest stands to benefit by at least 300 million yuan.

2. to facilitate the transfer of science and technology and promote the technical progress of small and medium-sized enterprises.

The scientific and technical market is an effective vehicle for speeding up the "four transfers" in science and technology and stimulating the technical progress of small and medium-sized enterprises. In June 1982, the Ministry of Industry organized in Taiyuan a scientific and technical achievements exchange and trade fair featuring in the main processing technologies suitable for both military and civilian uses, including 579 scientific achievements to be transferred with or without compensation. At the science and technology cooperation exchange fair in Shanghai in 1982, 107 achievements were transferred to the interior. In the same year, a scientific and technical achievements trade fair took place in Kunming in August, a major feature of which was the inland transfer of scientific and technical achievements, as borne out by the fact that over 260 achievements, or 15.75 percent of total exhibits, were entered in the fair by other provinces and municipalities. Devoted as it was to the introduction of technology, the Changzhou science and technology cooperation exchange fair provided an even clearer example of a small or medium-sized city obtaining technology from large cities. Of the 208 deals successfully negotiated at the fair, 181 involved other provinces or municipalities offering help to Changzhou in tackling its key technical projects. These 208 deals amounted to 45 percent of all projects seeking assistance at the fair. After investigating the scientific and technical market in such places as Shanghai, Tianjin and Jiangsu recently, a task force under the State Economic Commission reported that scientific and technical markets have indeed promoted the technical progress of small and medium-sized enterprises. First, they provide a kind of technical support. Eager to be of help to small factories, the Tianjin "science and technology store" once effected the transfer of an achievement for 40,000 yuan, substantially lower than the asking price of 180,000 yuan. Second, they have promoted the technical progress of rural and township industries; one third of the problems for which the Tianjin "science and technology store" invited bids belonged to those industries. Third, they secure social recognition for individual scientific achievements. A Tianjin worker invented a method to regulate the brightness of fluorescent lamps. To the benefit of both inventor and industry, the "science and technology store" arranged for its transfer to a factory for 4,000 yuan. Fourth, they cut down on the elaborate and tedious procedures of technical transfer. A certain Tianjin factory needed a rust-proof fluid cooler. The "science and technology store" invited tenders and only 5 hours and 150 yuan later, the problem was solved.

3. to facilitate the "mobility of expertise" and the exchange of experts.

The scientific and technical market is also an effective vehicle of promoting the "mobility of expertise" and the exchange of experts. For instance, the industrial science and technology achievements exchange and trade fair in Shanxi Province made recruitment one of its activities. Of the 150 agreements reached at the fair, 62, or 41.05 percent of the total, involved the recruitment of experts. To add a new dimension to the science and technology exchange and trade fair, an unprecedented expert exchange fair was held by the Personnel Bureau of Fujian Province in 1983. During the 2-day event, as various units scrambled for "people who could help make them rich," over 900

scientific and technical experts, including 800 people with advanced technical qualifications, found an employer. At present, expert exchanges have sprung up everywhere and it has become quite popular to recruit scientific and technical experts openly. The rational mobility of experts abolishes the ownership of experts by the units concerned, accelerates the transfer of technology and mobilizes the initiatives of scientific and technical personnel. The Wujin County Glass Fiber Reinforced Plastic Plant in Changzhou recruited from Shanghai four scientific and technical workers. Although they did not achieve anything in the 3 years they spent in Shanghai, these workers accomplished four projects within a year after they joined the plant, contributing immensely to improving its production conditions.

4. to develop scientific and technical decision-making and promote scientific management.

The Chinese Science and Technology Association, institutions of higher education, design departments and large mines and factories have set up a variety of scientific and technical consulting organizations one after another. Even as they actively go in for technology transfer, they also devote much efforts to technical consulting, management consulting, decision-making consulting and strategic studies, putting forward some sound suggestions and ideas and providing a scientific basis for government decision makers at all levels. According to incomplete data, scientific and technical consulting organizations in nine provinces and municipalities alone, including Beijing, Liaoning, Shenyang, Haerbin, Dalian, Chongqing, Hefei, Zibo and Anshan, offered assorted consulting services totalling 47,000 from 1982 through August 1983 and exercised a major economic impact. Using a systems engineering approach, the Shanghai Jiaotong University provided strategic consulting for Xinjiang's long-range development planning. Its advice has been accepted by the Xinjiang Uygur Autonomous Regional government as the scientific basis for its long-term plan.

The Status and Roles of the Scientific and Technical Market

The scientific and technical market occupies a key position and plays major roles in the development of China's science and technology. Its importance and roles are the very reasons why it emerged and has been able to develop rapidly.

1. The scientific and technical market is an important supplement to the state's science and technology development plan. Like society and the economy, science and technology in China are essentially planned activities. But the scientific and technical market, which is a form of "free trade," should be an important supplement to the state's science and technology development plan and serve as a regulator of the market. Numerous small and medium-sized pieces of technology can be transferred through the market. And since technology promotes social and economic development, the scientific and technical market also becomes an inseparable and indispensable part of the overall socialist integrated market.

2. The scientific and technical market promotes the development of science and technology. This relationship is mainly demonstrated in the following ways.

First, the needs of the scientific and technical market speed up the popularization and application of scientific achievements and new technology. Second, with their eyes on the scientific and technical market, scientific research and design units are more likely to pick the kind of projects suited to its needs. Third, the organizational mode of the scientific and technical market facilitates the participation of scientific and technical personnel in small and medium-sized projects and in technical services. Fourth, the scientific and technical market facilitates the organization of decision-making consulting and strategic studies. Fifth, the scientific and technical market promotes the formation and development of enterprises in technical services and scientific and technical consulting so that science and technology policies are implemented in depth.

3. The scientific and technical market promotes scientific and technical reform. The CPC Central Committee and the State Council have emphatically pointed out that for science and technology to have a real impact on the national economy, we must reform the existing system gradually and that we should begin by strengthening cooperation between basic units in our day-to-day work and slowly break down local and departmental barriers. Scientific research units and production units should establish a full range of cooperative relations and services with one another and some may even set up scientific research and production complexes. And the scientific and technical market exactly fulfills this bridging function. It brings together science and technology, on the one hand, and production, on the other, in the interest of cooperation, and paves the way for reforms in our system of scientific research.

4. The scientific and technical market also promotes scientific and technical management. In the face of a burgeoning scientific and technical market, the management of science and technology must deal with many new issues. For example, how to strengthen the unified control of the scientific and technical market, how should scientific and technical achievements be transferred with compensation, how to determine such compensation, how to determine the fee structure of key scientific and technical projects and how should income thus derived be distributed, what form should scientific research and production complexes take, and what form should complexes linking teaching, scientific research and production take. Other issues involve scientific and technical cooperation contracts, policies on the mobility of experts, the transfer of the after-hours achievements of scientific and technical personnel and the invention of a member of the public, and the prevention and correction of unhealthy tendencies in scientific and technical cooperation, so on and so forth. On the basis of their careful studies and investigations, scientific and technical management departments at all levels are now grappling with the above issues, devising and drawing up appropriate methods and regulations and establishing or perfecting a management system.

Urgent Problems

The scientific and technical market in China has a short history but a spectacular growth. At present, the market shows the following trends of development:

First, the tendency towards the development of "scientific and technical stores." Ever since Tianjin set up its "scientific and technical store," the idea has been taken up enthusiastically by the rest of the country. Second, there is a tendency for the market to enter the rural areas. Over 20 counties and districts in Jiangxi Province have gone into the scientific and technical market business since the beginning of this year and the province is now going all out to extend it to all its 92 counties and districts. The rural scientific and technical market, which comes in all shapes and forms, is an inevitable product of the "science craze" in rural areas. Third, the tendency for "scientific and technical market" to become "think tanks." To different extents, the various scientific and technical consulting organizations have become "think tanks," fully demonstrating their proper function in the decision making process. Fourth, the "industrialization" of the scientific and technical market. With its explosive growth, the scientific and technical market has become an essential part of China's new knowledge and information industry and is poised to bring about revolutionary changes to our industrial mix and technological structure.

The spectacular development of the scientific and technical market also poses for us a number of urgent problems which must be carefully examined and resolved if we are to ensure its healthy growth.

1. set up a new academic discipline -- scientific and technical market studies. Made necessary by the special characteristics of the scientific and technical market, this subject will be a multidisciplinary field involving natural sciences and, more importantly, social sciences. It is a branch of socialist marketing studies as well as scientiology. While it should cover the general principles of commodity production, circulation and exchanges, it should focus on the special developmental laws governing the production, circulation and exchanges of this very special commodity, science and technology; examine the characteristics, attributes and functions of the scientific and technical market and its roles and functions in the development of science and technology and the national economy; and explore the direction and trends of its growth.

2. strengthen research on our scientific and technical market policy. All localities have now drawn up some regulations to govern the transfer of scientific and technical achievements, but in view of the quickening pace of economic reforms and scientific and technical reforms, the decision to further open up the coastal cities to the world and the proliferation of scientific and technical development services and technical consulting organizations across the country, we still remain badly in need of a comprehensive nationwide management framework. We must mobilize the necessary expertise, put our heads together and formulate a series of policies as soon as possible to promote the scientific and technical market.

3. strengthen legislation relating to the scientific and technical market. Scientific and technical personnel who offer themselves for paid employment in their spare time have an urgent need for legal protection. After it went into effect, the economic contract law has done much to ensure healthy growth for the scientific and technical market, but as the market continues to develop, the need still exists for a separate contract law covering scientific and

technical cooperation exclusively. The remarkable growth in technical consulting has also given rise to an urgent need for a technical consulting law.

4. the scientific and technical market should be subject to the guidance of state planning. Like the market for agricultural and sideline products, the scientific and technical market suffers from a certain randomness. For instance, competing for the scientific and technical achievements involved in the manufacture of some popular products, several units at one point duplicated one another. This raises the question of the rational distribution of production. And distribution inevitably involves planning and management. It follows that the scientific and technical market should be open to state planning and management. Also, large valuable projects in the scientific and technical market should be included in the scientific and technical development plan or economic and social development plan at the appropriate locality.

5. strengthen the unified management of the scientific and technical market. In the absence of a specialized management agency, various local scientific and technical development exchange centers should take the initiative to unify their markets. Of course, as the market continues to grow, we may gradually establish a specialized scientific and technical market management agency in the interest of comprehensive planning and research. The development of the market stands to benefit from such an agency.

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NATIONAL DEVELOPMENTS

COMMERCIALIZATION OF SCIENTIFIC, TECHNICAL ACHIEVEMENTS DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT] in Chinese No 1, 12 Jan 85 pp 5-9

[Article by Li Shou [2621 1108]: "Scientific and Technical Markets Promote the Commercialization of Scientific and Technical Achievements"]

[Text] After it was set up in May 1984 as Tianjin's first permanent scientific and technical market, the Tianjin Science and Technology Development Service Center has not only promoted the transformation of science and technology and its achievements into a commodity and facilitated the mobility of science and technology and scientific experts, but also spawned the growth around it of a science and technology development cooperative network.

1. The Permanent Tianjin Scientific and Technical Market Has Promoted The Transformation Of Scientific and Technical Achievements As Well As Science and Technology Into a Commodity.

The permanent scientific and technical market attracts both sellers and buyers to it whenever they want to talk business. When a scientific or technical achievement is put to use and reaps economic benefits, the scientific research unit or workers concerned are remunerated accordingly. Alternatively they may collect a service charge or split the profits in accordance with a set ratio. A production unit can come to the market to shop for information, consulting services and technical services or to recruit experts. As a place where negotiations can be carried out and deals clinched, the market transforms scientific and technical achievements into a commodity and realizes the advantage of the close integration of the mobility of experts and the mobility of science and technology. It often finds a solution for many problems which have not proved amenable to administrative solutions. Four months after it opened for business, 3,000 items were discussed and a deal was struck in 830 of them. Its volume of business amounted to 12 million yuan. Preliminary estimates are that when the projects are put into operation, they will boost economic results by almost 100 million yuan.

The main activities in this area are:

(1) The transfer of scientific and technical achievements

At the scientific and technical achievements transfer booth, some achievements which were ignored in the past now find a buyer. During the first 4 months, contracts were signed for the transfer of 56 items worth a total of over 8.4 million yuan.

Through the scientific and technical market, various research units have made over to industrial departments a batch of scientific and technical achievements expected to be very useful in economic construction.

The transfer of scientific and technical achievements to rural and township enterprises has been instrumental in speeding up their development. The Rimian Institute in Tianjin has invented a machine to make carpet tassels. The technology involved was made over to a factory in Hetou Village, Tanggu District, which manufactures boilers and machines. The production cost per machine is only a little over 10,000 yuan, compared to the 140,000 yuan it takes to import a similar machine from abroad, resulting in a saving of more than 100,000 yuan. The Tianjin Science and Technology Development Service Center has established long-term cooperative relations with various provinces, districts, counties and townships.

The center has also had a hand in the transfer of a host of individual scientific and technical achievements and production technology. As urban reform quickens its pace, there has been a steady increase in the number of people who enter the scientific and technical market looking for a buyer for their scientific achievements and production technologies.

(2) Inviting bids to solve technical problems

The scientific and technical market includes a booth where bids are invited to solve technical problems. During the 4 months under review, about 280 problems were announced at the booth and contracts to solve 149 of them have been signed, which translates into 300,000 yuan in service fees for the units and individuals who undertook to tackle them. Many technical production problems have found a solution through the scientific and technical market, while universities, scientific research units and scientific and technical workers have been properly compensated for helping to solve them.

(3) Technical consulting service

Technical consulting service includes technical service and the transfer of applicable technology. Apart from institutions of higher education and research institutes, service providers include a technical consulting contingent of several hundreds of people. Forty nine technical consulting service contracts were signed within 4 months after the center opened, and service providers, both units and individuals, earned 113,000 yuan in service fees.

Nancai Village in Wuqing County produces a large quantity of improved watermelon, but has long been plagued by the problem of what to do with the rinds after the seeds were removed. A consulting service team went to the village to offer its service. It arranged for a light chemical research institute to try extracting melon juice from the rinds while the Fuchangxiang Preserved Fruit Factory used them to make melon strips. A contract has been signed and production is now under way. The projected annual output is 100,000 catties. Yuci Tire Repair Factory in Shanxi approached the scientific and technical market with a problem in the production of heat-resistant rubber. With directions and technology provided by the Tianjin Rubber Research Institute, the factory later succeeded in overcoming the problem.

(4) The joint use of large-scale equipment

To make full and cooperative use of the large-scale equipment of all units, the Large-scale Equipment Office of the Tianjin municipal Science and Technology Commission has put together in recent years a large-scale equipment cooperation network consisting of 254 pieces of large-scale precision instruments of 42 different types and 694 analysis and testing personnel. The network has undertaken 132 analysis and testing jobs at the large-scale equipment cooperative use booth at the scientific and technical market and made 28,000 yuan in analysis and testing fees, or about 500 machine hours, equivalent to the annual workload of a medium-sized machine.

After the scientific and technical market opened for business, five units -- the Thermophysics Department at Tianjin University; the Spaceflight Medical Engineering Research Institute; a bureau in the Ministry of Communications; the Tianjin Mechanical Research Institute, Ministry of Machine Industry; and the Waste Materials Research Institute, Ministry of Commerce -- offered six pieces of large equipment to the municipal large-scale equipment cooperative network as a way of providing society with testing and analysis services. The six pieces of equipment include an infra-red thermal imaging system, a large-scale whizzer, an infra-red range measurement system, a metalloscope, an atomic absorption spectroscope, and a meteorological chromatic spectrometer.

(5) The development of computer software

At the computer software development booth, the Tianjin Joint Software Company undertakes to develop computer software, offers for sale 960 kinds of software products, provides consulting services relating to computer applications and engineering, and contracts to design computer application systems. So far it has been approached by scores of users from other provinces and municipalities as well as from Tianjin and its outlying counties with 80-odd proposals and has signed agreements for a number of large projects, such as a microcomputer-controlled pump station, data collection and the calculation of water quantity In addition, it has provided technical consultation to dozens of units on the choice of hardware, offered technical advice on computer application, organized nine lectures on new technology and information, developed electronic products for rural and township enterprises and invested in plant construction. The scientific and technical market is an important window to the Joint Software Company to marketing, consumer contacts, information exchange and contracting for jobs.

(6) Organization of rural scientific and technical country fairs

To strengthen the orientation of science and technology towards rural and township enterprises and support the development of the rural commodity economy, we and the branch company in Baodi County jointly organized in early November a 3-day rural scientific and technical country fair involving 21 scientific research units. Over 40 research institute heads, chief engineers and other scientific and technical personnel went to the countryside taking with them more than 100 pieces of scientific and technical achievements applicable to enterprises in such industries as light textiles, chemical engineering, food, machine building, building materials, leather and equipment maintenance and repair, and 70 categories of technical services. Party secretaries from the various villages in the county, village heads and representatives of rural and township enterprises eagerly descended upon the scientific and technical fair to inquire about technical products, negotiate deals and ask for technical services. Twenty-seven contracts, 48 letters of intent and 107 consulting service agreements were signed during the 3-day event, generating 4.6 million yuan of business altogether. The Heat Treatment Research Institute transferred its depository titanium nitride technology to various Zhao villages and invested 100,000 yuan. The projected annual profit from this deal is 200,000 yuan. The rural and township enterprises said, "The rural scientific and technical fair has got the Midas touch."

2. The Scientific and Technical Market Has Facilitated the Exchanges of Technology and Experts and Promoted the Mobility of Experts.

Through the trade in technology, the scientific and technical market has not only brought about the mobility of expertise but also that of experts. In line with State Council Document No 111 outlining the regulations governing the rational mobility of scientific and technical personnel, the Tianjin Municipal Science and Technology Commission came up with a method, already endorsed by the municipal leadership, to recruit scientific and technical personnel on a trial basis. The method was tried out in the scientific and technical market by the Expert Development Office of the Science and Technology Development Service Center. So far over 2,000 people have advertised for workers and more than 1,000 people have applied to fill the vacancies. Negotiations have been held in 200 cases and about 60 contracts have been signed, including 31 cases in which the employee brings a scientific achievement to his employer. The recruitment method stimulates the rational mobility of experts and constitutes a heavy blow to the practice of eating from one big rice pot, the iron rice bowl phenomenon and the departmental ownership system, at the same time making it easier for scientific and technical personnel to give full play to their talents to benefit economic development and the four modernizations.

Take, for instance, Han Biao [7281 1753], formerly a technician at the No 2 Cold-Drawn Steel Plant in Tianjin. He is an expert in the production technology of special oils and additives, neither of which was produced by the plant. With the permission of his unit, Han Biao was invited to head the Jinnan Dongfang Special Oil Factory recently established by the Dongnigu Brigade in Tianjin's southern outskirts. This came about under the auspices of the Tianjin Science and Technology Development Service Center which brought

together the three parties. Han Biao's original employer granted him a 2-year leave of absence without pay. The brigade pays the No 2 Steel Plant a 3,600 yuan management fee each year. It also made an investment of 100,000 yuan in a new factory hiring 100 workers and put Han Biao in charge of plant construction, the purchase of raw materials, production technology and the marketing of products. The target is to recoup the factory's capital outlay within a year. Han Biao is paid a monthly salary of 150 yuan by the factory. Should year-end profits reach 300,000 yuan, he would be entitled to 5 percent, and if profits exceed 300,000 yuan, his share would be reduced accordingly. Working round the clock, Han Biao has now completed a laboratory and produced several rust-proof oils, including 201. All raw materials for processing have been secured and the factory is fully booked for this year, although some units in Tianjin, Henan and Shaanxi still want to place additional orders.

Another example is Pan Xiqin [3382 0431 0530], who used to be an assistant researcher with the Labor Hygiene Research Institute. After graduating from Hebei Engineering College in 1961 where his specialty was macromolecular compounds, he devoted himself to analytical chemical research throughout. But the unit he was originally with could not give him enough work to do. So on the recommendation of the Expert Development Office, he was transferred to a small collectively owned factory - Tianjin No 3 Analysis Instruments Factory, and is set to become its chief engineer. Then there is Yang Fengnian [2799 7364 1628], a retired electroplate worker who used to work in a watch factory. Through the scientific and technical market, he was hired to take charge of three kinds of electroplating in five factories in Wuqing County. His work has been well received. The factory managers said, "In the past, we had to throw out the waste liquid each year. After Master Yang came and solved the technical problem for us, we no longer have to discard the waste liquid, solving the pollution issue at the same time saving several thousand yuan."

The Tianjin Rubber Research Institute is where the chemical engineering industry has been trying out its pilot projects in economic contracting. The institute recently ruled that research workers can undertake various technical jobs for small and medium-sized enterprises, street enterprises and township enterprises, provided that they have fulfilled their regular assignments. In line with institute regulations, comrades from two offices in the institute registered en masse with the Expert Development Office and through its contacts, two of them were hired as technical advisers by Zhongtang Hardware and Rubber Factory in the Dagang District to assume responsibility for all the technical problems of its old and new products. The mobility of experts acquires a new dimension when scientific and technical workers are allowed to go in for technical exchanges in their spare time or on the job provided they have completed their regular duties.

However, since neither the Municipal Science and Technology Commission nor the Municipal Science and Technology Development Service Center has jurisdiction over questions related to the exchange of experts, some problems still remain.

3. A Scientific and Technical Cooperative Network Is Taking Shape Around the Science and Technology Development Service Center

Through the operations of the scientific and technical market, institutions of higher education and research institutes have established cooperative relations in science and technology with the municipal Science and Technology Development Service Center. Following the meeting called by the Science and Technology Commission for chairmen of the various district and county science and technology commissions to work out arrangements to develop scientific and technical work in counties and districts, branch companies of the municipal service center have been set up in Heping District, Baodi County and Jinghai County, etc. as subsidiaries of the municipal center. The shareholding units and cooperative units of the various specialized technical companies attached to the service center have also become its (the center's) members or coopertive units.

After the Tianjin scientific and technical market opened, many returned overseas students, enthusiastic for scientific and technical exchanges, took part in it actively and expressed a desire to get organized. To make better use of this pool of scientific expertise and supported by the municipal Science and Technology Commission, we set up the Tianjin Returned Overseas Students Science and Technology Development Club, which has a current membership of 150. The aim of the club is to create the right conditions for returned overseas students to develop intellectual resources, popularize domestic and foreign advanced science and technology, strengthen international scientific and technical connections, exchange scientific and technical information and open up new scientific and technical territory, etc.

Moreover, we have established the Tianjin Microcomputer Cooperative Union, a voluntary association for technical cooperation of 115 experts and engineers who either own a microcomputer or are engaged in the development of microcomputer software and hardware. Its primary goals are to develop a microcomputer system, expand the application of microcomputer in management and control, develop academic exchanges and technical cooperation, solve technical problems encountered by microcomputer users at the grassroots level and improve the standard of microcomputer applications. Then there is the Tianjin Joint Energy Resource Technical Federation, which to date has brought together 120 units in the municipality and over 150 experts, engineers and scientific and technical workers in a concerted effort to provide technical consulting in the prospecting, transportation, conveyance methods, rational utilization and comprehensive planning of energy resources. In addition, it will work to develop expertise in the field of energy and popularize and apply new technology, equipment and various energy-saving measures. It will also link up with domestic and international energy technology information networks to provide information and bring together scientific and technical personnel from all fields in order to make the development of science and technology an undertaking that involves the entire society and the masses. We also plan to set up die, electroplating and automobile training centers with the units concerned, developing expertise to cater to the needs of economic growth.

4. Make Industrial Use of Technology and Set Up Specialized Technical Companies

To convert science and technology into productive forces expeditiously and transform knowledge and technology from an intellectual commodity into a

material commodity, we are establishing a batch of specialized technical companies and have already set up the following:

(1) The Tianjin Joint Software Company, an interindustry, interprofession software development company involving various institutions of higher education and scientific research units. It was founded on the principles of voluntary association, democratic management, assumption of responsibility for losses and profits and to each according to his work. Funds are raised through the issue of shares and dividends are distributed at regular intervals. To become a stockholder, a unit must have the capacity to develop computer software and put in an application for the right to buy stocks. Currently there are 62 stockholders, including institutions of higher education, scientific research units and production units, which between them have raised a total of 460,000 yuan. In addition, 1,130 technical workers have joined the company to undertake software development jobs. The company is equipped with 241 microcomputers of varying degrees of sophistication. By pooling the municipality's computer application capability, the company has created a rudimentary software industry. In just 4 months, it has contracted to do a host of projects, such as microcomputer-controlled project, management computerization at Darentang Drug Factory and the computerization of a silk dyeing plant. The computerization of the high-temperature sterilization of infusion bags, a project it undertook for the Heping Drug Plant, has been technically evaluated and delivered.

(2) The Tianjin Joint Energy Resource Technology Development Company, a cooperative effort between 6 factories, 10 scientific research and management units and a number of scientific and technical personnel. This company has succeeded in integrating the various aspects of energy resource engineering, from research and design through production and construction to testing and trial operations, and has earned 30,000 yuan in service fees from just one project, namely, converting heating by steam to heating by high-temperature water. Since the company provides a "package deal" form of contracting, its clients are spared the inconvenience and formalities of going to different units for design, construction and testing services and achieve considerable savings. In only 2 months, the company has completed energy-saving design projects for about a dozen units.

(3) The Tianjin New Electronic Technology Development Company, made up of a group of engineering and technical workers and senior managerial personnel who have retreated to the second and third fronts. Its business scope includes developing new electronic technology; providing consulting service regarding the construction of new electronic enterprises and the technical modernization of existing ones; developing and popularizing new technology in electronic enterprises; providing technical consulting service regarding the introduction of foreign technology, joint ventures and compensatory trade; introducing foreign advanced technology; organizing technical exchanges; and sponsoring exhibitions, displays and training courses, etc. The company has established professional relationships with foreign firms and is about to launch its projects.

(4) In the works are the Ocean Shipping New Technology Development Company, a joint venture with foreign interests, and other companies to develop coastal

and river mouth technology, new materials, new products and bioengineering technology.

5. Some Lessons

(1) The leadership attaches a good deal of importance to the scientific and technical market and promotes it in a reform-minded way. The municipal CPC committee, the municipal government and the municipal Science and Technology Commission have strengthened their leadership over the development center, personally supervising and guiding its work. The Science and Technology Commission has decided that economic means and horizontal integration are useful supplements to administrative methods in developing science, technology and experts successfully. Because of the extensive exchange of information and the fact that service providers and clients can deal with one another in person to draw up mutually satisfactory contracts in accordance with market conditions and economic distribution methods, many problems formerly insusceptible to administrative solutions have been resolved through the scientific and technical market.

To satisfy the demands of the Science and Technology Commission, we strive to be "unconventional" in form, "flexible" in method and "prompt" in work so that the market can take off within a short period of time.

(2) Turning science and technology into a commodity and establishing permanent scientific and technical markets are essential to promoting scientific and technical development and the exchange of experts and constitute a breakthrough in scientific and technical reform. As the commodity economy develops and as we implement our science and technology policies, we come to realize that scientific and technical achievements are the most valuable commodity and that technology and information create value and can be exchanged, like any commodity. To transform scientific and technical achievements into a commodity, we must open up a market for them. The scientific and technical exchange and trade fair is only partially effective as a scientific and technical market because it lacks a permanent site and is of limited duration. Only by establishing a permanent scientific and technical market with fixed premises can we regularly and effectively promote science and technology and the mobility of experts and make science and technology a commodity.

(3) Scientific and technical development must be intimately linked to the development of experts. Scientific and technical experts are the catalyst of science and technology. Units in need of science and technology must also be supported by appropriate scientific and technical personnel. And it is their need for more and better opportunities to give full play to their expertise that drives experts to seek rational mobility. As a result, scientific and technical development and the development of experts must be closely integrated. The mobility of experts takes many forms. It can be effected with or without removing a particular expert from his unit. We must pay attention to both possibilities and put an end to the stagnation resulting from the immobility of experts.

(4) We must make do with what we have, start small and build up our operations gradually. We started out with no regular staff, no permanent site and no

funds, but we made use of the exhibition hall of the municipal Scientific Equipment Company and opened our door for business even while we were still drawing up plans, and the scientific and technical market soon became a reality. We have already repaid the 100,000 yuan planning cost lent us by the equipment company with our service income. We are entirely self-sufficient in staff wages and other expenses and have accumulated a small amount of funds. Now that the municipal Science and Technology Commission has allocated us a sum of money to cover development and operating expenses, we are in a stronger position to further our work and find a site for the market. Guided and supported by our higher authorities and other sectors of society, we will continue to rely on our own resources to develop science, technology and experts.

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NATIONAL DEVELOPMENTS

RELATIONSHIP BETWEEN ECONOMIC REFORM, SCIENTIFIC DEVELOPMENT DISCUSSED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 1, 12 Jan 85 pp 12-13

[Article by Yang Peiqing [2799 1014 7230]: "Economic Reforms and Scientific Reforms Must Go Hand in Hand"]

[Text] 1. How should the relationship between scientific and technical progress and economic reform be interpreted?

The "Resolutions" passed by the 3d Plenary Session of the 12th CPC Central Committee are reticent when it comes to issues related to science and technology, but their few references to reference should be taken seriously. The "Resolutions" point out that science and technology calls for a separate discussion and that decisions will be made elsewhere. As I see it, science and technology are treated separately for the following reasons:

(1) It is profoundly important. The CPC Central Committee has issued many instructions concerning science and technology and Comrade Deng Xiaoping told the National Science and Technology Conference that science and technology is a productive force. Subsequently, Comrade Zhao Ziyang noted at many meetings that economic prosperity must depend on science and technology and that we must consider it the basic goal of modernization and a matter of strategic importance in the nation's development.

(2) Science and technology involves numerous issues as complex as many we come across in reforming the economy. There are several reasons for this complexity. First, science and technology covers such a vast area that both material production and nonmaterial production departments are bound to run into scientific and technical issues. Second, science and technology has its own special laws and characteristics. We cannot solve scientific and technical issues with administrative means or the same approach with which we managed industry in the past. Since science and technology must be tackled differently than industrial management, we must take a long hard look at its laws and characteristics. Third, the scientific and technical system involves many issues which are related to economic laws, economic leverage and the market mechanism. In other words, science and technology has a bearing on just about every reform item in the "Resolutions."

(3) For many people, science and technology are a novelty. It is only in recent years that China began to understand it. In a recent speech, Comrade Zhao Ziyang noted that after a long period of research, we now see that the focus of our efforts to reform the scientific and technical system should be the technical market and the commercialization of our scientific and technical achievements. In the past, the thrust of scientific and technical reform was the "compensatory contracting system." Actually, the "compensatory contracting system" itself already involves opening up the market for scientific achievements, but it is only recently that we explicitly introduced the concept of the market into science and technology. The scientific and technical community is still debating the best way of expressing the concept and there is no consensus as yet. In the wake of rural reforms and the adoption by the 3d Plenary Session of the "Resolutions Concerning Economic Structural Reform," the community is confronted with a string of new questions. What used to be regarded as of no concern in the past now looms large as urgent questions which must be answered. For example, the scientific community previously had nothing but contempt for the transfer of scientific research achievements for a fee and considered people who harbored such an idea good-for-nothings and loafers. Concerning the mobility of experts, should there be fixed (directional) mobility or rational mobility? Can it be that rational mobility is in fact directional mobility? Then there is the question of autonomy. What form should autonomy take in the scientific and technical community? Today it is clear and beyond dispute that one major manifestation of scientific autonomy is the freedom to form project groups. But if everybody agrees that autonomy in the scientific community means, among other things, the freedom to form project groups, this, in turn, raises a host of new issues. With people free to form groups, what will happen to those excluded? If the director of a research institute is empowered to hire people through recruitment, what about the people not recruited? Some of the new issues raised have to be answered by our theorists. We have been paying lip service for many years to the idea that science and technology is a form of productive force, but in the real world of production, how many comrades have actually succeeded in converting science and technology into a productive force? From what I have read, economists in capitalist societies have discussed this aspect of economics extensively, devoting to it many chapters in their books. Encyclopedias in the Soviet Union and Eastern European nations have an entry for science and technology under productive forces. In contrast, our economic community has dealt with it in a very cursory manner. Other issues raised concern the party's work. After the institute director responsibility system comes into effect, how will the relationship between him and the party committee secretary be affected? How will the party committee secretary, the branch secretary and party organs actually function? In what way will the concept of the party control of cadres manifest itself under the new circumstances? In the past, the research institute director assumed responsibility and it was within the party committee's power to transfer cadres and assign them jobs. Today, with the recruitment system under which the director picks his own people, how can the party control the cadres? New issues also emerge for economic management departments as well. Since traditionally economic management never defined science and technology as a productive force, government agencies in charge of economic management as well as enterprises did not pay science and technology much attention. Nowadays, however, scientific and technical questions have been put on the agenda and

scientific and technical reforms are under way, sending shock waves throughout society and posing new challenges. This is why the CPC Central Committee decided to deal with science and technology as a separate issue. On no account should one infer from the few references to science and technology in the "Resolutions" that it is not important. On the contrary, it is the very vitalness of science and technology which makes it worthy of a separate study.

2. Why Must Economic Reform Be Coordinated With Scientific and Technical Reform?

Because scientific and technical work is closely related to economic work.

(1) As science and technology is a productive force, economic reform must take into account scientific and technical questions. Science and technology is closely related to economics. The leadership of any dynamic society, any advanced industrialized country and any vital enterprise must take science and technology very seriously.

(2) Scientific and technical reform is an inseparable part of economic reform. It must proceed in tandem with the latter.

(3) To accomplish our strategic goals by the end of the century, we must depend on first, policy, and second, science and technology.

The basic guiding ideology and principles of economic reform are totally applicable to the scientific and technical arena. Since the basic aim of economic reform is to invigorate the economy, science and technology must also work towards that goal. At the same time, scientific and technical reform must take into account its own laws and characteristics.

In my opinion, scientific and technical reform and economic reform should proceed in accordance with the following principles. First, economic reform should contribute towards scientific and technical progress, a point already made in the "Resolutions." Most essentially, economic reform must be conducive to the full utilization of scientific and technical talent. Second, scientific and technical reform must adapt to the new situation resulting from economic reforms. For example, scientific and technical work must be geared towards economic construction, while economic construction must rely on science and technology. After this interrelationship was put forward, it was met for a time with some rather sharp reactions. It was strongly felt that the problem with orienting science and technology towards the economy lies not in science and technology itself, but in the economic enterprises which must first generate the demands and pressures for science and technology to gear itself towards the economy. After the 3d Plenary Session of the 12th CPC Central Committee, as they made their foray into the market, many enterprises immediately realized the importance of science and technology. At the same time, it is science and technology itself which is falling behind the times. Third, scientific and technical reform is not a problem for scientific and technical units and their personnel alone. Take, for instance, labor and personnel systems. The research institute director in some cases cannot be simply appointed by a higher authority. He must be a leading authority in his field and capable of exercising effective leadership. In these circumstances,

how do we reconcile recruitment, election and appointment? Another example is wages. China traditionally looked up to "officials" and looked down upon "experts." People usually believe that senior engineers, researchers and professors should be paid less than bureau or department heads. Hence wage issues must also be discussed and examined. Then there is the question of funding. Scientific research units are institutions. If the financial agencies distribute funds in an equalitarian way, there is no guarantee that key research projects will be adequately funded. Related to this is the question of how funds are spent. Investigating the way appropriations are spent by some projects, we noted that one key project was allocated 650,000 yuan. After checking with the group which has contracted to carry out the project, we discovered that less than 50,000 yuan actually made its way into its hands, and the other 550,000 yuan was not spent on scientific research. Yet another related issue is tax. In the past we had only two kinds of units, institutions and enterprises. The former is governed by its own tax code. Now that institutions are profit-making units responsible for their own profits and losses, the tax question also arises. How are scientific research units going to be taxed? Certain countries now take the easy way out, taxing them the way they tax enterprises, thus denying scientific research units reproductive capacity. Some countries in Eastern Europe are currently trying to change this state of affairs. Hungary, for instance, gives preference in tax matters to scientific research units which succeed in making over their achievements profitably. Then there is the question of credit. We have all kinds of banks - in agriculture, industry and commerce, construction, every thing except in science and technology. This testifies to our past failure to regard science and technology as a productive force, a failure which must be corrected. On the one hand, we must demand that scientific research units become economically independent. On the other hand, we must scrap the old method of allocating operating funds on a per capita basis, which means that funds dry up at research units before income starts coming in from research projects. The advantage of borrowing is that it constitutes a strong incentive for the debtor to go all out to achieve the highest economic results possible to pay back his loan. At present, the Democratic Republic of Germany, Bulgaria and Hungary have basically adopted a system of borrowing from banks. Pricing is yet another problem. Some scientific research achievements are bought and sold at such low prices that certain people are prompted to comment that knowledge and scientific achievements are worthless these days. There is a lingering problem comparable to the mass seizing and eating of food in the homes of landlords during a famine before the liberation; as soon as a research unit becomes profitable, other units scramble to cream off its earnings. Legal problems exist, too. As we ask scientific research personnel to give full rein to their abilities and find a social purpose for their techniques, achievements, knowledge and skills, there also arises the phenomenon of after-hours employment and contracting and moonlighting. Some comrades have been generously rewarded by production units which were able to improve their economic results considerably thanks to their work. This has been seized upon by certain people and denounced as a violation of the law and an infringement of discipline. In reality, our investigations show that many of these denunciations were not justified. The reason for this kind of problem is that many of our laws, regulations, systems and management methods are still far from perfect. Finally, there is the planning issue. There are two kinds of economic planning, guidance and

command. In view of the characteristics of science and technology, we believe that guidance planning should play a more important role in the future management of science and technology. We should guide scientific research units to choose projects, tasks and technical services in accordance with the directions set by the state. More emphasis should be placed on economic means and less on administrative management.

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NATIONAL DEVELOPMENTS

DISCUSSION OF EFFORTS AT QUALITY CONTROL

Beijing ZHILIANG GUANLI [QUALITY CONTROL] in Chinese No 3, 1985 pp 5-6

[Article by the Bureau of Quality, National Economics Commission: "A Survey of Quality Control Work Done in 1984 and Preliminary Plans for 1985"]

[Text] In 1984, work in quality control enthusiastically employed the principle of the Central Committee to "Open to the world and invigorate the domestic economy." There were new developments in improving product quality, improving the standard of management, and improving the quality of enterprises.

I. 1984 was the 7th year that we have held a Quality Month activity.

Quality Month activity has already become a time each year in which to judge us, and to encourage an improvement in the level of quality control. It is a conventional activity in which to exchange experience and learning. The 7th National Quality Month Awards Conference was held on 31 August in Beijing. Leading comrades of the Central Committee and the State Council, leaders of the National Commission on Economics, as well as comrades from the National Committee for the Examination and Approval of Awards for Quality awarded plaques, cups, and certificates to the top quality products, top quality engineering, top quality food products, and artistic handicrafts of 1984, as well as to the outstanding small group for quality control. At the same time, seven quality control advanced enterprises were issued awards for national quality control.

Both before and after the Quality Month, the leading comrades from each province, autonomous region, municipality, and department universally mobilized and deployed, and integrating each particular condition earnestly inspected, appraised, commended, and summed up in the aspects of product quality, service attitude, and civilized trade. They then selected a group of top quality products and advanced enterprises in quality control from the provincial, autonomous region, and municipal levels.

In order to encourage and support enterprises in improving product quality, and to arouse an enthusiasm in workers and staff to strive for top quality products, each area has proposed objectives to reach for and particular measures to be taken, and many areas have formulated methods and rules for

rewards. Provinces and municipalities like those of Shanghai, Shaanxi, Guizhou, Sichuan, Hunan, Liaoning, and Jiangsu have all clearly determined bonus quotas for award-winning enterprises and individuals. There are also a few professions, as for example the machinery and weaving industries, that have undertaken top quality, top pricing experimental work for a portion of their products, which has achieved very good results.

1984 also saw developments in critical selection. Since the issuance of the "Rules for Rewarding Top Quality Products in the PRC" in 1979, we have had several years of practice in critical selection, in which we have obtained excellent results. Currently, the slogans "Strive for top quality, snatch up the trophy" are present in every enterprise and have become a driving force for enterprises to mobilize the majority of staff and workers in improving product quality. The number of trophies has already become an index for the provinces, autonomous regions, and municipalities to measure the level of local industrial technology.

Critical selection has advanced a planned striving for excellence, with much effort spent on the word "striving," as many provinces and cities have written programs for product critical selection. In 1984, the National Commission on the Economy issued notices seeking a 3-year plan for technological transformation, development of technology, and striving for excellence in products, and has made advances in the planned integration of striving for excellence in products with importation of technology, technological transformation, and technological development. For example, of the 500 item plan for seeking excellence in Shanghai, one half of those items referred to plans for importing and for transformation. In 1984 there were already 15 departments that had written 3-year plans for striving for excellence, which has created a basis for a true transition to planned, goal-oriented striving for excellence.

The 1984 work of producing quality results has achieved new improvements in three areas:

1. Achieving quality results in products has promoted work in advancing technology, for technical advancement provides a dependable material guarantee for the search for excellence in products.

For a long time the quality of our products has been low and their performance lacking, and there has been a high consumption of energy and raw materials. Aside from the level of quality control in enterprises, technical advancement in enterprises has been slow, for which obsolete technical equipment has been an important reason. At the First National Conference for Technical Advances in Enterprises in 1983 it was clearly pointed out that the goals for work toward technical advancement are to improve product quality and to lower expenditures. There have been outstanding accomplishments in regional and enterprise joint searches for product excellence in the work of resolutely striving for technical transformation, introduction of technology, learning and accepting, and in key technical problems. There was a large number of projects that received commendation and reward at the Second National Conference for Technical Advancement in Enterprises, held in November 1984.

2. The achievement of quality in products has improved the economic results for enterprises.

According to statistics, the top quality, name brand products of any area have increased greatly, the proportion of top quality products has improved, and economic results have continued to grow. As for example the Chongqing Steel Company, for which over the last 4 years steel output has basically stabilized at about 600,000 tons, while profits have increased annually nearly 20 million yuan; profits for 1984 exceeded 100 million yuan, chiefly because of a realization of improvements in the number of top quality products. Their proportion of top quality products in 1981 was only 25.38 percent, while that reached 67.3 percent from January through August 1984.

Hunan Province investigated the economic results for 156 national and local quality products throughout the province, for which top quality products the average growth rate in output value was 15.2 percent, the average growth rate for income from sales was 15.6 percent, the average growth in profits was 23.1 percent, and the rate of profits on output value was 18.8 percent, which is nearly double that of ordinary products. After winning a silver prize in 1083, walking tractors produced by the Hengyang Tractor Factory went from an annual output of 12,500 units to 15,000 in 1984, and profit increased from 270,000 yuan to more than 2 million yuan in 1984.

3. The achievement of quality in products has spurred enterprise alliances.

In order to increase the production of top quality, name brand products, and expand the output of top quality products, at the meeting early in 1984 of the economic working conference, Comrade Zhang Jingfu [1728 0513 1133] proposed the requirements for linking production to extension of quality for producing top quality products, as well as establishing discounted loans. After the conference, things moved quickly in all areas, and for enterprises that had been praised for top quality products, discounted loans were increased, and production of top quality, name brand products has been expanded, some of which have already seen results. This can be seen in the joining of the Shanghai Bicycle Factory with bicycle factories in Shaoxing, Suzhou, etc., where the Shanghai factory provides equipment, technology, and training of personnel to jointly produce name brand bicycles. It is expected that next year production of name brand bicycles will increase to 1 million bicycles.

But linking production to extension of quality has just begun, and there are many policy questions that need research and resolution. For joint operation there must be a need on both sides, each based on its own desires. We ought to earnestly sum up our experiences in this regard, and organize this extremely significant work.

There were new advances in promoting full scale quality control in 1984.

In September 1983, Premier Zhao Ziyang met with the full body of representatives attending the National Quality Control Small Group Representative Conference, as well as issued the important document in October of that year entitled "Strengthening Full Scale Quality Control, Improving Enterprise Quality," which has elicited a strong reaction both domestically

and abroad. The whole group of staff and workers on all our fronts has been actively industrious in taking up in full measure the spirit of Premier Zhao's speech, and they have forcefully promoted full scale quality control, from which has emerged a group of advanced models. After evaluation in 1984, another seven enterprises won national quality control awards, and another group was preliminarily judged to be quality control advanced enterprises. The shared characteristics of these enterprises are: all have had a set of full scale quality control experiences appropriate to the characteristics of their respective lines of work; they have a rather complete quality control system that is integrated with the economic responsibility system, and consequently their products are of high quality, their economic benefits are good, and they are strongly competitive in the market.

The 3d Plenary Session of the 12th CPC Central Committee made a resolution concerning the restructuring of the economic system. This programmatic document also made new demands on the work of quality control. The great successes in the restructuring of the countryside, the favorable developments in restructuring the urban economy, the appearance of the new world technical revolution, and especially China's desire to greatly develop a socialist commodity economy and to protect market competition, have all meant even higher new demands on product quality. In the economic restructuring a group of entrepreneurs having the technology, understanding management, knowing how to run a business, and with foresight, are energetically developing products, improving quality, creating top quality, name brand products, and are striving for great developments in enterprise. They are in an unbeatable position in domestic and foreign market competition. But several problems have cropped up in quality control. As for example where there have appeared in certain areas and enterprises vague concepts and methods that are not beneficial to quality work. Here there has been an erroneous relaxing of quality work, a lowering of quality standards, a weakening of the inspection functions, a loosening of quality supervision, and adoption of mistaken methods regarding quality control structures. Some enterprises have even felt that with contracts one need not be concerned with quality, but instead just seek quantity and profits, even to the extent of using methods of slipshod manufacturing and fake trademarks to promote their own products on the market. There are also some urban enterprises that have rushed into things without preparing the manufacturing situation nor conditions for technical management. They are contending for popular products and products in short supply, which they have sold in large amounts to the detriment of the purchaser. We must take a serious look at these kinds of mistaken thinking and ways of doing things.

II. Preliminary Plans for Quality Control Work in 1985

The 3d Plenary Session of the 12th CPC Central Committee has already made clear the directions and tasks for China's economic work from now on. And in this new year our quality work will further advance the implementation of the spirit of restructuring that was in the 3d Plenary Session, which has given a new look to the work of quality control. Initially, we plan to take up the following things:

First, to pay close attention to work on quality related laws and principles and policies. In the legal aspect, China has already promulgated certain laws and regulations, as for example, laws regarding hygiene in food products, drugs, economic contracts, trademarks, standardized management regulations, regulations for permission and licensing for trial run of industrial products, etc. Within these laws and regulations there are always requirements for product quality. Quality control workers will study and apply these laws to promote the improvement of product quality. However, these things are not enough, and still more laws, policies, and methods must be formulated. As for example, the "Regulations for Product Quality Responsibility" (draft) and the policy of pricing according to quality. Under conditions of microcosmic invigoration we must also pay attention to the overall picture. Monitoring by the government, society, and the consumer must be strengthened.

Second, to continue making plans for the seeking of quality. The 3-year plan for the search for quality from 1985 through 1987 that was written this year has already been entered in the national plan for technical advancement, in which there are altogether 609 key products from 15 departments that have been included in the plan. 1985 is the first year that the plan is in effect, which in the aspects of funds, energy, and raw materials will be earnestly implemented by relevant departments. This will be sure to link up work in the search for quality together with the plans for introduction of technology, technical transformation, and the dissemination of technology. In 1985 we will also write the 3-year plan for moving forward in producing quality results from 1986 through 1988.

Third, to pay close attention to information exchange. We will keep the information channels open for quality control, especially for those experiences and that data, etc., that pertains to improving economic results, so that we can react quickly. For survey material on its provincial 156 national and local level quality products, Hunan Province is an excellent example. Everyone wants to be good at survey research, to bring out in a timely fashion the good experiences and good models, as well as existing problems. This is to be able to put out what is good on time, and stop that which is flawed, and operate according to the PDCA methods of quality control.

Fourth, to continue to pay attention to critical product selection in 1985 and to reform the methods of critical selection. Critical selection practice over the past few years has proven that this is an effective method for improving product quality and promoting technical advancement. We want to reform and perfect the methods of critical selection on the basis of reviewing our past experience. We want to maintain high standards, to increase the power of professions and departments, to strengthen the building of product quality inspection centers, to give full play to the various levels of departments of standards, measures, and quality supervision, all of which will allow future critical selection to be normalized, systematized, and scientific, where everything is based upon actual data. At present, in the evaluation of quality products we want to be especially watchful for sturdy, durable work, for work handled scientifically, and we want to guard against the occurences of high targeting, pursuing formalism and fraud.

Fifth, we want to continue promoting full scale quality control and selection of quality control award enterprises. Practice has shown that full scale quality control is a science for enterprise administrative and management science and for managing technical modernization. For enterprises to promote full scale quality management will have a very great encouraging role on the improvement of enterprise quality, on the improvement of product quality, on the improvement of economic results, and on an improvement in the ability of products to compete.

To best manage the selection process for quality control awards we have invited a few comrades with theoretical and practical experience to formulate a draft of regulations, which will be put into effect after further revisions.

12586
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NATIONAL DEVELOPMENTS

MANAGEMENT, ADMINISTRATION OF TECHNOLOGY MARKETS

Taiyuan JISHU JINGJI YU GUANLI YANJIU [RESEARCH ON THE ECONOMICS AND MANAGEMENT OF TECHNOLOGY] in Chinese No 2, Apr 85 pp 6-9

[Article by He Jicheng [0149 0679 2052]: "A Discussion of the Management and Administration of Technology Markets"]

[Text] The "CPC Central Committee Resolutions Concerning Reforms In Economic Systems" adopted by the 3d Plenum of the 11th CPC Central Committee pointed out that: "Full development of the commodity economy is an inevitable stage of socioeconomic development and an essential condition for modernizing China's economy. Only through full development of the commodity economy is it possible to have a truly dynamic economy." The commercialization of technology markets and technical achievements is a special realm of the commodity economy. Its formation and development in a certain sense indicates that commodity production has entered a new developmental stage. The synchronized reforms in economic systems and in scientific and technical [S&T] systems have caused all types of technical development companies, consulting companies, development companies and various forms of technology stores and technical exchange organizations to spring up like shoots after a rain. They are applying scientific and economic theories for intensive discussion of the administration of technology markets, management of technology markets, research on technology markets and other questions. They are of great importance for invigorating socialist technology markets, for promoting the commercialization of technology and for fundamental changes in the operational mechanisms of S&T systems.

I. Administration of Technology Markets

Administration of technology markets refers to market policy activities in research development organizations that increase the use value of technical achievements and that provide the optimum economic results in research organizations. Good administration of technology markets requires intensive research on the structures that support technology markets and on comprehensive strategies for development of technology markets. It includes questions in the following three areas:

1. Technical development policies and technical product strategies

During the modern era of rapid advances in S&T, an enterprise's product is one of the primary determinants of its success or failure. Technical work is

concretized as an important factor in achieving the value of a product, and the process of product exchange and circulation also is one of technology exchange and circulation. The main thing in determining whether or not an enterprise earns a profit or corners a market is to see if the product meets the needs of consumers or not. The question of whether or not the intellectual products produced by scientific development organizations can capture technology markets is determined primarily by whether or not they satisfy the needs of technology consumers. Social demand for technology, therefore, becomes the primary question in administration of technology markets. The principle of technical production is to satisfy social demand for technology. It certainly should analyze trends in commodity markets to formulate its own technical development policies and technical product development strategies.

Technical products can be divided into two types: hard technology products and soft technology products. The first type refers to the technology such as new equipment, new materials and new products that are concretized in the product. The latter is the technology that has drifted away from the product, such as drawings, data, technical design, advanced management methods and so on. Technical development policies refer to developmental realms given priority in research and development [R&D] organs and to the selection of primary technical groups as priority development realms. A correct technical development policy can make it possible for technical producers to occupy a profitable position in technical competition. Technical product strategies refer to the selection of forms of products and circulation patterns for technical products. The difference between technical products and conventional material products is that the former are characterized by repeated consumption and invisible consumption. For this reason, the wide variety of benefits from technical products is a question that must be considered in research on technical product strategies.

In research on technical product strategies, another question that deserves our attention is the one of the life span of technology. The life span of a technology refers to the process of a scientific research achievement or technical combination starting with its entry into a market and extending to its withdrawal from the market. The life span of a technical product is related not only to the development of S&T itself but also is restricted by commodity markets that cannot be changed by the subjective will of man. Scientists and economists have divided the life span of technology into the period of sprouting, the period of growth, the period of maturity and the period of decline. There is some relationship to hard technology products, where new products enter, grow, mature, saturate and decline in commodity markets. As for soft technology products, the corresponding production measures and methods are even newer. For this reason, Japan, among other countries, has had a technical product strategy of producing the first generation, trial manufacturing of the second generation, research on the third generation and conceptualization of the fourth generation that has supported rapid development of the Japanese economy. The significance of research on the life span of a technical product is due to the fact that it is based on the law of the rise and decline of technical products and conventional commodities. Determine an R&D strategy for each technical product, improve its percentage market share and employ expanded technology markets to invigorate commodity markets.

2. Value strategies for technical products

S&T achievements are commodities that can be exchanged like normal commodities, but the forms and conditions of exchange are not the same. They do, however, have the important characteristics of commodities and must observe the principle of exchange at equal value.

A special quality of the value of technical products is that they include technical value and economic value. Technical value, moreover, usually is included in economic value. Strategies concerning technical value refer mainly to the economic value of a technical product. The economic value of a technical product includes the three parts of the actual value of a technical product, its secondary value (also called additional value) and its latent value. The actual value refers the net income obtained from the sale of a conventional product after industrial production of an S&T achievement or technical product is accomplished. Secondary value refers to the obvious "additional value" produced by a technical product after its utilization, such as a "catalyst," "additive," a "new type of functional material" and so on. The secondary value of these technical products often is much greater than the actual value they produce themselves. Latent value refers to the broad utilization prospects and the possibility of a substantial increase in the number of users and the life span of a technical product. We propose that the maximum estimated value of a technical product be called its latent value.

Strategies concerning the value of technical product refer to the principle of determining compensated transfer or market sale of technology. The price of a conventional commodity in reality is equivalent to the costs of production and profits. The price of a technical product cannot use this method in its entirety. The reason is that there is no normal proportional interrelationship between the cost and amount of R&D. For this reason, the prices set for technology should be based on the economic benefits produced after the technology is utilized and should mainly be actual value. The secondary value and latent value of a technical product, however, can be fully embodied only after a large amount of exchange in technology markets. For this reason, the state cannot make unified decisions concerning the price of a technology. It should be set, therefore, through mutual negotiation between buyer and seller according to the regulation mechanisms of technical markets. The following methods often are used for pricing technical products in the compensated transfer of technology at the present time: the one-time price setting method, the profit division method, the value of output division method, the R&D cost recovery method, the amount of construction investments method and others. Furthermore, the price of a technical product also may be set in consideration of such related elements as the degree of difficulty in R&D, the representation of a technical product, the quality factors of a technical product, the size of the effects created by the related technologies, the scope of technical exchanges, life spans and other questions. There should be different value strategies for different classes and types of technical products.

3. Strategies for managing sales of technical products

Management of technical sales organizes activities between technical producers and technical consumers through mutual links of technical circulation.

Strategies for managing sales of technical products have two connotations. The first refers to the conversion of technical products through the medium of exchange from producer (R&D organization) to technical consumer (production enterprises). The second refers to the organizational structure of management of technical sales. R&D organizations wish to derive excellent economic benefits from activities related to the management of sales. Not only must the research topics that are selected deal strongly with real questions, but they also must improve the efficiency of R&D, control and lower the costs of technical products and make them able to compete in technical markets. Even more important is that it is very easy to forget that the optimum circulation channels and patterns must be selected to accelerate the pace of technical product circulation, to place technical products on the market at the most appropriate time and to strive to reduce as much as possible the loss of value of technical products during the process of technical circulation. There are two main types of organizational structures for managing sales of technology. The first is compensated transfer of the technology to its users by the producers of the technology themselves. The second is through special intermediate links such as technical trade departments, technical consulting organizations and so on that transfer the technical products of R&D organizations to their users. This process is technical sales.

Sales of conventional technologies are determined by market behavior and conditions and the structural characteristics of social purchasing power. Sales of technical commodities must consider the situation in the industrial structures of society, developmental trends of technology and the changes in the structure of technical demand caused by them. Circulation and sales of technical products, therefore, should take into consideration the elements of the technical product itself, such as value and life span, the position of the technical product in technical systems, the interchangeability and competitiveness of other technologies in circulation and so on, and it also should consider market factors like the number and distribution of technical users and so on.

Technical sales involves a sequence of links between technical sellers and technical buyers in technology markets. The process of technical sales not only includes the exchange of information on technical products to introduce the technical products of sellers, but even more important is that it must use this measure to stimulate the objective desire of enterprises to utilize the technology so as to expand the amount of technology in circulation and increase the economic benefits of technology.

Strategies for sales of technology can be divided into three types: push strategies, pull strategies and comprehensive strategies.

Push strategies use exhibitions of technical achievements and technical trade conferences for producers of technology to introduce their technical products to those who need them. The main method of push strategies is to provide manuals or samples of the technical products to those needing the technology. The sellers and buyers of the technology also carry out technical discussions. During the process of technical discussions, the sellers of the technology can collect a variety of the latent technical needs of the buyer and gain a deeper

understanding of the orientation of technical demand in technology markets, while the buyer of the technology can gain a full understanding of R&D trends from the seller. In this way, the exchange of information between both sides will greatly increase the efficiency and benefits of technology development policies.

Pull strategies use radio, television, newspapers, magazines, billboards and other means to disseminate technology advertisements and attract buyers for technology. Their goal is to gain users in more locations. Advertisements for technology serve the same purpose as advertisements for commodities. They are an important aspect of strategies for managing sales of technology. Sellers of technology should pay strong attention to such questions as how to do technical advertising, the characteristics of technical advertising, the marginal benefits of advertising and other questions.

Comprehensive strategies do not introduce the technical products themselves, but instead use various patterns and routes to introduce the situation in the R&D organizations themselves. Examples include the direction of technical development, the equipment situation of an organization, its historical evolution and technical strengths, the social reputation and image of its technical products and other things. By making a stronger impression on society concerning the R&D organization itself, society will come to have dependable confidence in its technical products and thereby expand the scope and amount of technical sales.

II. Management of Technology Markets

Management of technology markets refers to the ability of R&D organizations to organize market activities and includes four main areas. The first is the organizational pattern of sales administration departments. The second is technology market plans. The third is control of technology markets. The fourth is technology market prediction and policies.

The organizational pattern of sales administration departments in technology markets certainly must be adapted to the overall goals of coordinated development of S&T and economic construction. Market organizations of different forms, categories, scales and levels establish improved technology transmission and technical sales transmission to speed up the process of converting technical commodities into material commodities. In terms of the origin and development of technology markets, the organizational form of technology sales administration departments is affected by the strengthened social significance of technological commercialization and goes through the following main stages: The first is the stage of reliance primarily on technology sales by technical commodity production departments, in which the producers themselves sell their technologies to society. During this stage, the related departments do not have to provide the same specialized sites for the sellers and buyers of the technology. The sprouts of compensated transfer of technology is this type of organizational form. The broad scope of technical trade and exchange are restricted during this stage. The second stage is a period of indeterminate length when technical exchange and trade conferences and technical trade fairs dominate. Sellers and buyers of technology have a fixed site in this situation, and carry out compensated exchange through discussions. The

sellers of technologies can sell their technical products to many buyers for compensation, while buyers of technology can obtain technologies in many areas in technical trade conferences to organize and coordinate technical systems needed urgently in their own production. This will greatly improve the scope and efficiency of technical exchanges. The lack of a fixed technical trade site and fixed trade period during this stage, however, makes it impossible to eliminate quickly the time differential between supply and demand for a product. This means that society urgently needs a technology store and a place for exchange and trade that has a fixed site, fixed personnel and a fixed scale of sales administration. This causes the organizational form of technology markets to enter the third stage of development of technology markets--the stage of networks of technical sales administration departments. The main problem in the organization of technology markets at present concerns the question of how to establish a three-dimensional technology sales administration network that combines various organizational forms that are operationally dynamic and that have unimpeded flows of information and convenient services. At the same time, it causes the concept of the commercialization of technology to permeate the organizational structure of the entire industrial system. Only in this way will it be possible to use the pivotal nature of technology markets to truly link up S&T and economic construction.

Technology market plans are the blueprints for R&D organizations. The formulation of technology market plans certainly should start with the technical requirements of technology buyers or users and decide upon production according to demand. Information in three areas must, therefore, be correctly understood when formulating technology market plans. The first area is developmental trends in conventional commodities, which concerns the areas of technical developments that can turn around or change the status of a commodity in commodity markets. The second area is the current situation in the structure of social demand, the current technological levels of enterprises and the current structure of technology. The third area concerns the utilization situation for existing technical achievements and intellectual products. The primary goal of technology market plans is to use readjustment of the rate of benefits and profits of a technical product so as to stimulate the enthusiasm of R&D organs for development and production of the most needed technologies and to stimulate the enthusiasm of producing enterprises for seeking out and using new technologies in technical markets, thereby raising R&D efficiency.

Technology market forecasting and control. The concept of control is directly related to the goal orientation of control. Without goals, control is meaningless. Control of technology markets serves to guarantee technology market systems under changing external conditions so that they achieve the maximum results of the circulation of technology through the shortest routes, the most optimum programs and the least amount of investments, thereby controlling the coordination of the developmental chain of "technical products--technology circulation--technology consumption--product (technology) renewal--sales in new product markets" between technology markets and commodity markets. Achievement of this goal requires continual surveys of commodity markets and technology markets, applying the laws and characteristics of scientific and technical development, revealing the developmental directions and real elements of S&T, and predicting new S&T discoveries and the prospects for applications of new inventions to provide data for readjustment of R&D directions and plans.

III. Research on Technology Markets

Research on technology markets concerns an intensive exploration of the process of sales administration in technology markets. Objectively speaking, technology markets themselves are large and extremely complex systems. Intensive research on the factors that influence the sales administration process in technology markets requires research on goal systems, technical product classification systems, circulation systems, user systems and so on. It is comprehensive, not independent, research on the coordinated roles of the structure of technology markets and of socioeconomic structures, industrial structures, technical structures and the structure of social and scientific capacity. We should study differences and changes in circulation rates in different regions, the amount of technical products used by society and utilization rates. Only in this way is it possible to grasp the process of market behavior and effectively utilize technology markets. In a micro perspective, research on technology markets should include surveys of technology markets, research on the market structure of technical commodities and research on the functions of technology markets.

Surveys of technology markets refer to the collection of feedback and information after circulation of a technical product. Specialized survey personnel can be organized to go to the units that use the technology to obtain direct on-the-spot information concerning production. They also can use the Te'erfei [phonetic] method to organize personnel from each area to make evaluations. This will provide more reliable data for further improvements in technologies and for development of related technologies.

The market structure of technical commodities mainly concerns research on the relationship between the form of a technical product sales and utilization rates and conversion periods for technical products. Based on their form, technical products can be divided into hard technical products and soft technical products. Based on the links during the process of scientific research and technical development, they can be divided into basic research products, applied research products and development research products. We should deal directly with the origin, nature, uses, value and other interrelationships and possible continuous relationships of each type of technical product and do systematic analysis to create the conditions for systematic combination and combination of circulation and sales in technology markets for each type of technical product. We should use the function of technology markets in organizing technology to improve the value of clusters of technical products.

Research on the structure and function of technology markets involves analysis of the circulation links and circulation sequences for technical products to formulate standards and regulations for scientific and technical markets, to make continual improvements in the organizational system of techonology markets, to shorten the circulation period of technical products and to improve the social and economic results of technical products.

The above is a very coarse discussion of several questions in the management and administration of technology markets and it contians some errors. Development of technology markets has just begun in China. Besides the large amount of intensive research on real problems that must be done, proceeding from the present reality means that establishing a theoretical system for technology markets that is suited to China's characteristics is extremely important.

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NATIONAL DEVELOPMENTS

TRANSFER OF MILITARY TECHNOLOGY TO CIVILIAN USE DESCRIBED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 4, 12 Apr 85 pp 6-7

[Article from the Comprehensive Planning Ministry of the National Defense Science Work Committee: "Transfer of Military Technology to Civilian Use Is Major Component of China's Technical Markets"; responsible editor: Zhao Beiwang [6392 0554 2598]]

[Text] While serving national defense, the national defense science and technology (S&T) industrial system has adhered for the past year or more to its orientation of serving national economic construction and thus has made great progress in the work of transferring military technology to civilian use. Judged by the number of projects, the volume of business and the economic results of the technology transfers alone, the military system signed 416 economic technology contract plans of all kinds with civilian units in 1983. But based on incomplete statistics for 1984 from 14 provinces and municipalities such as Liaoning, Shaanxi, Hebei, Jiangsu, Hubei and Heilongjiang alone, it signed over 8,000 technology contracts of all kinds and the volume of business reached 430 million yuan. After these projects are completely accomplished, it is estimated that they will be able to create over 4 billion yuan a year in economic results for the state.

In carrying out the work of transferring military technology to civilian use, all regions and departments have created many good forms and methods and achieved remarkable results.

1. Popularizing Fairly Mature Military Technology Results to Civilian Departments Can Quickly Achieve Remarkable Economic Results. For instance, the salt bath furnace high-speed switch technology of the Ministry of Weapons Industries saves 45-75 percent of the electricity and 65-85 percent of the time as compared to traditional methods. Since this technology has been popularized by the said ministry's New Technology Popularization Institute, study classes have been held for 1,500 people in 14 provinces and municipalities throughout China, 300 factories have transformed 700 furnaces and it is estimated that 14 million kwh of electricity a year can be saved.

2. Trial Manufacture and Production of Technology and Equipment with Fairly Great Technical Difficulties and Fairly High Production Usefulness Will Promote

the Technological Transformation of Civilian Departments. For instance, the viscose automatic-sieve net filter machinery designed and manufactured for the textile industry by the 606 Institute of the Ministry of Aviation Industries is one of three major technological transformation projects of the Ministry of Textile Industries; six sets have been put into production and performance has fully achieved the standards of imported machinery. Using the said equipment can save workshop space, coal, electricity, water, cotton and viscose and reduce pollution, and a single machine creates 330,000 yuan a year in profits. One hundred and fifty sets of this equipment are needed throughout China and after they are completely utilized, they will be able to create 49.5 million yuan a year in profits and save 25.5 million yuan a year in foreign exchange for the state.

3. Extensively Developing Technical Services and Advice and Using Advanced Technology and Management Experience Will Solve Problems for Localities. For instance, the leak stoppage technology service team of Liaoning Province's military system has successively helped four regions stop dozens of major leaks. In order to help stop leaks from cracks in municipal gas storage cans, they have retrieved former gas leak losses of 20,000 cubic meters a day and over 7 million cubic meters a year with a value of over 4 million yuan, while accepting only 800 yuan in service fees. Since stopping leaks, the Tianjin General Petrifaction Factory has retrieved over 10 million yuan a year in production stoppage losses created by leaks. According to statistics from the concerned departments, if this new technology is popularized and used throughout China, it will be able to reduce economic losses created by production stoppages of 300 million yuan a year.

4. The Transfer of Technology Will Form Specialized Cooperative Joint Systems, Development and Management. For instance, the Jingjing Optics Factory in Chengdu was formed by merging five neighborhood enterprises, had simple and crude equipment and backward technology, engaged in ordinary lens processing and lacked competitive ability. The 208 Factory of the Ministry of Weapons Industries, which has optical glass production advantages, bought shares with funds and equipment, divided profits 40 percent and 60 percent, stressed giving processing technology support and provided colored and white semifinished lens holders on favorable terms, quickly enabling the "Jingjing" eyeglasses produced by this small factory to be on sale throughout China and the factory to be listed by the Ministry of Light Industry as a production plant site for exporting eyeglasses. The Jingjing Optics Factory took three major steps in 3 years, its number of staff members and workers increased from 65 to over 240 people and its space from over 80 square meters to a newly built factory building of 1,900 square meters, it has 36 pieces of equipment and 2 production lines and its eyeglass output has increased 17-fold, output value 12-fold and profits 14-fold.

5. Lifting Restrictions on Intelligence, Measuring, Experimental Measuring and Calculating Equipment Will Serve Civilian Departments. For instance, the China Boat Co's Shipping Technology Research Institute engaged in nearly 800 civilian technology businesses in 1983 alone; its designed Chinese-language disposal systems software has been used by domestic Wang computer users, the State Goods and Materials General Office and the Capital Iron and Steel Co and

places such as Sichuan and Inner Mongolia; and it has exported shipping management system integrated software systems to Yugoslavia's Wulanika [phonetic] Boat Factory.

All local governments are now strengthening the organiation and leadership of the work of transferring military technology to civilian use, establishing and perfecting administrative and economic management organizations, perfecting policies, laws, regulations and systems and using many forms to promote mutual understanding between military and civilian technology, link up technology supply-and-demand information and create a basis for further cooperation. Governments in all areas have combined the transfer of military technology with local economic development and included it in the economic development plans of local civilian departments.

Finally, leading comrades of the Central Committee and the State Council have repeatedly emphasized that under the conditions of a socialist commodity economy, technology is also a commodity which can circulate and be bought and sold. We must open technical markets and exercise market regulation of technical results. The State Council has also issued temporary provisions for the transfer of technology. These will certainly greatly promote the work of transferring military technology to civilian use, free the masses of scientists and technicians from the fetters of all kinds of restrictions, further open up and invigorate the circulation of technology, the flow of intelligence and the exchange of qualified personnel and enable the national defense S&T industry both to serve national defense and to take new steps on the road of combining military and civilian technology to serve national economic construction.

12267
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NATIONAL DEVELOPMENTS

FURTHER OPENING OF COASTAL CITIES, S&T MANAGEMENT REFORM RELATED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF S&T] in Chinese No 4, 12 Apr 85 pp 15-16

[Article by Wu Peining [0702 3099 1337] of the Zhejiang Province Scientiology and S&T Management Research Society: "Further Opening of Coastal Cities and S&T Management System Reform"; responsible editor: You Siyi [3266 1835 1837]

[Text] I. New S&T Needs of Open Coastal Cities

1. Urban development plans, major basic-facility plans, developing-industry development plans, traditional-industry transformation plans and all major macroscopic social and economic development decisions must first have corresponding S&T development decisions. For instance, questions such as what level of technology should be imported to transform old industries and what line of technology should be used to transform an industry must all be answered by S&T management departments; questions such as how economic development zones can establish knowledge- and technology-intensive forms of industry and which developing technology should be selected based on the actual conditions of each area must also rely on answers provided by S&T workers.

2. Along with being sold inside China, in order for the products of these cities to be geared to international markets and be put into world-class competition, S&T must provide advanced ways of collecting and transmitting information.

3. The goal of importing advanced technology is not only to develop production but, more importantly, to accelerate the development of China's S&T and especially to promote the development of production technology. Therefore, S&T departments must place digesting and absorbing advanced foreign technology in an especially important position.

II. New Contradictions Facing S&T Management Departments

1. S&T management departments have still been unable to make an S&T development plan corresponding to opening plans, and even when formulating certain major economic and social development plans, they have found themselves in nonessential positions.

2. Scientific research plans do not correspond to production development and lag behind economic development plans. Selecting scientific research problems in the field of production technology is obviously insignificant as compared to technically transforming industries and systematically transforming enterprises.

3. "Service" priorities do not correspond to needs for further opening. S&T management departments not regarding the transformation of old industries and the digestion and absorption of imported technology as their most important duties have resulted in their work often being excluded from priority open-door policy work.

4. S&T management standards do not correspond to new requirements. S&T management department cadres have very few foreign contact opportunities, the phenomenon of information being inaccessible is very serious and S&T information is even inferior to that of industrial departments. There are few creative cadres, many conservative ones and also many with rigid ways of thinking.

III. The Key Is in Carrying Out S&T Management System Reform, and a Further Opening Must Be Synchronized with System Reform

The S&T work priority of recently opened small and medium-size coastal cities is to stress applied research, especially the digestion, absorption and development of advanced domestic and foreign imported technology. Since the existing system completely separates S&T management departments from the S&T departments of production units, the responsibility of promoting economic development thus does not fall on the shoulders of municipal-level S&T management departments. Duties and responsibilities are unclear, there is no pressure and impetus is lacking. The present situation is, on the one hand, that no one solves major economic development S&T problems which urgently need solutions and, on the other, that S&T management departments look for their work on the "periphery" of economic work. There is much invalid work in all management departments and duplicated work between them which thus also results in a series of relationship contradictions. It is thus clear that the problem of "two covers" for S&T and economic construction is still principally a management system problem.

Realistically considering the problem, the management systems of the small and medium-size open coastal cities can be:

1. The S&T management department will be the managerial department of S&T work throughout the city. Its basic duties should be to unify the S&T development plans of all trades and to be responsible for supervising the promotions of scientists and technicians; in the field of economic development, it will be responsible for formulating development directions for industrial structure, developing new industries and formulating plans for the development of major new products and for technological transformation. It will be a management organization with substantial duties.

2. Since carrying out the system of the city managing the county, these cities are gradually forming a fairly comprehensive and relatively independent economic system in which each has its distinctive characteristics, and the three

major management systems of planning, production and S&T must be established corresponding to their characteristics. These three major systems will work cooperatively under the unified leadership of municipal governments.

In summary, the foundation of S&T management system reform should be mainly to adapt to production development needs. The total duty of S&T management departments is of course not only to manage production technology, but it is a very important task.

IV. Two Problems Urgently Needing Research

1. We should carry out the principle of "using duties to establish organizations." Organizations can only be produced by duties. If the basic duties of an organization can be replaced or are duplicated by another organization, it should then be merged or eliminated.

In order to promote S&T management system reform, we must boldly press duties on S&T management departments, regard economic work as an S&T requirement and especially as the work of production technology research management, clearly set the major duties of municipal-level S&T management departments and allow these departments to strengthen and reform themselves through practice.

2. We should select and apportion cadres by rotating the cadre ranks. Very few present S&T management cadres truly come from frontline production and they lack perceptual knowledge of the importance and laws of studying production technology. Thus, the planned rotation of cadres between management departments and between management departments and basic levels, and the carrying out of the methods of leadership responsibility, organizational supervision, level-by-level job advertisements and clarification of terms of office will play a major role in strengthening the vitality of management departments. In view of the need to ensure work continuity and the relative stability of cadres, the scope of this circulation should be less than one-third.

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NATIONAL DEVELOPMENTS

EXAMPLES OF TECHNICAL RESTRUCTURING IN SHANGHAI SHOWN

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTOLOGY AND MANAGEMENT OF S&T] in Chinese No 4, 12 Apr 85 pp 16-17

[Article by Gu Wenxing [7357 2429 5281], Shanghai Municipal Science and Technology Commission: "Five Measures for Restructuring Science and Technology Organizations in Shanghai"]

[Text] 1. Restructuring the Management Organizations of Research Will Invigorate Scientific Research Cells.

Shanghai has had experimental stations for restructuring scientific research units ever since 1979, sites that have carried out the expansion of autonomy, the contract system whereby each individual is responsible for his own expenditures and budget, and science and technology responsibility systems. At present, 228 independent research institutes throughout the city have implemented the "budgeting responsibility contract system," nearly one-fifth of which units are practicing the consideration contract system, and for some, operating expenses are not deducted from one-third or two-thirds of the institute research funds, while others are economically independent. Based on sampling surveys, among scientific research organizations throughout the city, there are units already trying technical economy accounting systems, science and technology responsibility systems, technical contract systems, and institute head responsibility systems, at 40 percent, 48 percent, 70 percent, and 51 percent, respectively, with about 38 percent practicing a floating wage structure.

The core elements of these reforms are: a change from a unitary administrative management to a form of management where economic levers are primary, with administrative measures as supplementary. Practice has shown that working this way is beneficial to breaking up the situation of "department rights" and "local rights" and overcoming the abuses of "the supply system" and "eating out of the same pot," which then allows research institutes to face up to society and face up to economics. Based on sampling surveys: over the past few years, the annual rate of increase in scientific research projects and results from science and technology at 85 percent of research organizations has reached 27 percent and 75 percent for each, respectively; for 48 percent of units, application rates for results from science and technology have averaged a 39 percent annual improvement; and for 80 percent of units, annual

growth rate for economic income from technology transfer and technical service has already reached 60 percent.

2. Develop Research Organizations that Have Multi-form Ownership Forms and Operations Modes in which All the People Have Ownership, and Strengthen and Fully Develop Capabilities for Scientific Research in Competition.

Over the past few years, there has been a succession of research organizations and technology development service organizations in Shanghai that have had collective ownership and ownership of a hundred other kinds. This has broken up the long time unitary structures of "research institutes owned by the whole people" and "national monopolistic scientific research." These units are the "Sixth Route Army" of the science and technology front, and act as an important supplement to national research organizations, which together with state-run organizations for the development of research are a source of wealth for society. Because ownership systems are different, these types of organizations build up quickly, are vigorously active, and results are quick to come. The Shanghai Mold Technology Research Institute is a good example. It is a new type of economically independent, solely responsible research organization run jointly by Shanghai's Jiaotong University (national) and the Shanghai Handicraft Cooperative (collective). Since its establishment in 1983, it has already accumulated more than 7 million yuan and has gathered together 104 specialists in 14 fields from more than 10 universities and enterprises in both this country and abroad. In fact, this research institute has already become a transnational pluralistic and complex integrated body. In 1984, of seven research results that directly served the economy and were obviously beneficial, five were awarded prizes for scientific achievement.

3. Set Up Integrated Bodies for Scientific Research and Production, Promote the Integration of Science and Technology with Economics, and Speed Up Technical Advances in Enterprises.

According to incomplete statistics, 2,022 integrated bodies for scientific research and production have been established in Shanghai. There are many forms to these integrated bodies, chief among which are seven: (1) A loose satellite pattern. This makes up about 60 percent of the total. Primary groups are educational and research (design) units, all around which there is a group of production factories specializing in carrying on with new achievements. Organization is rather loose, connected by project contracts, and the final goal of which is developing new technology and new products. (2) Overall development of an enterprise and region. These are about 8 percent of the total. This breaks up the boundaries between departments and regions, and is not restricted by ownership. The goal is overall development of the region and enterprise. (3) Technical and economic entities. These are about 25 percent of the total. These set up enterprises with the joint funding of research units and production units, management is joint, and profits are shared. (4) Project contracts. In general these take design research units as primary, combining relevant research, manufacturing, construction, installation, etc., units into engineering contract companies, with responsibility for the complete set of services, like workshop design, construction, equipment purchasing, non-standard equipment from manufacture through installation, and debugging. The end user needs only to receive the

key from the contracting company and can then go into production. Internationally, these are known as "key companies." (5) Pluralistic complex types. This kind of integrated body has invariably gone from a grouping of several different specialties and research organizations of different disciplines to then join together with production units. (6) A type that develops great new and rising technology and forms new and developing industries. That is, they organize together research institutes, institutions of higher learning, design units, and factories that are engaged in research, development, testing, and production, which connects the various links into a whole. (7) International Cooperative Developments. These jointly develop cooperative research, cooperative design, and cooperative development with international research organizations or enterprises.

4. Establish Banks of Science and Technology Personnel and Promote the Restructuring of Personnel Matters for Scientists and Technicians.

To solve the problem whereby on the one hand talent is insufficient or on the other hand it is oversupplied, municipal governments have formulated relevant rules for the rational movement of scientists and technicians. Using the methods of concurrent posts, temporary transfers, "project contract workers," consulting, and direct transfer, they have broadly and effectively developed the exchange of talent, and have as well made preparations in June of last year for a "Shanghai Development Bank for Technical Talent," depositing "in the bank" the excess personnel over a fixed number for research institutes and institutions of higher learning and after implementing a consulting system, helping the people "in the bank" renew their knowledge, and transferring people to units lacking them. This is both a "reservoir" of talent and a "multi-channel valve" for the movement of personnel that also performs a "refresher course garden plot" function. This organization has been around for 9 months, during which time it has "deposited" nearly 5,000 scientists and technicians, accepted nearly 10,000 applications "seeking talent," and already handled transfers of more than 300 people to new units. Because there is a face-to-face meeting with the unit requesting talent in the process of transferring people, and some are given trials, those who are successful generally match their profession, movements are reasonable, and things can be accomplished in a short time.

5. Open Up the Technical Market and Change the Structures of Movement in Technical Systems.

The Shanghai technical market that has arisen in these times of technical and economic developments has developed explosively in the last few years. Looking at it from the point of view of market organizational structures, it has developed from the one system, "sole business" of 3 and 4 years ago to an exchange of knowledge in technical development and technical management among six large systems centrally and more than 300 business locally. This has preliminarily formed a sales network for commercial products. From the point of view of form, it has developed from a single "technical conference of donkeys and horses" to establishment of a technical market report, to opening a "technical department store" and "technical shop," and to running a "public forum for technical information," etc. From the point of view of content, it has developed from a hardware business of mostly "promoting accomplishments"

and "key problems in projects" to the software business of technical consulting, technical service, technical training, and information handling. In 1984, for just the science and technology advising service center of the municipal science association alone, there were more than 3,500 topics for advisement, with advising fees of 10 million yuan. When these projects are finished, they can create for society an economic value of 1 billion yuan. From the point of view of the space involved, it has already developed from the original technical exchange between professions and this port, to technical business transactions that are trans-profession, trans-province, municipality, and region, and even trans-national.

The facts tell us that the rise and flourishing of the technical market, the mechanisms in motion for the changes that have taken place and are now just taking place are divorced of technical systems from economic departments, the majority of research organizations freeing themselves from solely administrative methods that are external to facts of production and the market, are a kind of new mechanism just beginning to form that is closely related to the economy, and is "market-- research and development-- market."

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NATIONAL DEVELOPMENTS

STRATEGIES, MEASURES FOR S&T PROGRESS DISCUSSED

Hefei ANHUI RIBAO in Chinese 27 Apr 85 p 4

[Article by Gao Zhong [7559 6988]: "Brief Discussion of Strategies and Measures for S&T Progress"]

[Text] In studying and demonstrating Anhui Province's economic development strategy, it is essential to analyze and have a clear understanding of the proportion and growth of the role of scientific and technical (S&T) progress in economic development.

The National Planning Commission's Economic Research Institute has proposed a method for calculating the proportion of S&T progress factors in economic growth, i.e., breaking down the annual S&T progress rate from the gross output value growth rate and then breaking down the output value growth of the three major sections into S&T progress contributions, fund contributions and labor contributions, thus being able to see the size of the role played by each of these three key elements in economic growth.

During the 31 years from 1952 to 1983, the annual S&T progress rate of Anhui Province's publicly owned industry was only 2.4 percent and S&T progress contributions also correspondingly constituted only 17 percent of this. In other words, over 80 percent of our output value growth resulted from a greater investment of funds and labor, fund contributions being 22 percent and labor contributions 61 percent. These figures show that, first, S&T progress has been rather slow and has played a rather minor role in Anhui Province's economic development; second, the major way of developing the economy has been of the "extension type" and not the "intension type," i.e., taking supplemental funds and especially labor to carry out expanded reproduction as the major factors; third, economic development has been of the "rate type" and not of the "results type;" fourth, Anhui Province's fund and labor growth rates have all along been slowing down and there have also been large gaps in the supply of natural and energy resources. This is forcing us to change from the "extension type" to the "intension type" and from the "rate type" to the "results type."

In order for Anhui Province to accomplish our part of quadrupling the gross annual output value of industry and agriculture by the year 2000, the annual growth rate of our gross output value of industry and agriculture must pass 9.4

percent, our annual S&T progress rate must reach 6.7 percent and our S&T progress contribution to output value growth must reach 71 percent. It can be seen from forecast results that our part of the goal of quadrupling the gross annual output value of industry and agriculture by the year 2000 has made great demands on our S&T progress, that it will absolutely not do for the role of our S&T progress only to maintain the level of the past 30 some years or since the 3d Plenum of the 11th CPC Central Commottee and that it must be greatly improved.

In order to accelerate S&T progress and promote economic growth, we think we should stress mastering the following strategic measures:

First, we should accelerate the development of intelligence. This is a strategy to get at the root of accelerating S&T progress. Only 4.4 percent of Anhui Province's capital construction investment from 1949 to 1983 was used for scientific education, which was far lower than that for all material production departments. Anhui Province's education lags behind that of the rest of China, the proportion per 10,000 people of students having junior high school educations or higher in 1983 was the lowest in China and only 3.9 percent of the people employed throughout Anhui are specialized technicians. Since the S&T educational levels of workers are low, the popularization and application of S&T in production are limited, inventions and creations are few, technology is backward and labor productivity is low. Thus, we must increase our investment in intelligence, enabling it to grow together with or lead that of economic construction. Moreover, we must actively carry out education and scientific research system reform, tap new sources and use many forms to accelerate the pace of intelligence development.

Second, we should improve the work of transforming and importing technology. This has been the major way in the past decade of improving the role of S&T progress in economic growth. Generally speaking, in carrying out technological transformation of existing enterprises as compared to building new ones and forming identical production capabilities, two-thirds of the investment can be saved, three-fifths of the materials and equipment can be saved and construction time can be reduced by half. If we only rely on building a few new, technically advanced enterprises and do not technically transform the over 16,000 existing ones throughout Anhui Province, we will be unable to improve our overall socio-technical standards and will have problems in accomplishing our strategic goals by the end of the century. We should strengthen the supervision and management of the use of funds to renew and transform, integrate the importation and transformation of technology, strengthen investigations, plans and measures and carry out Anhui Province's technical transformation work in actual situations.

Third, we should stress popularizing and applying scientific research results. This will be an effective way to improve quickly the role of S&T progress in economic development in the near future. The utilization rate of scientific research results in the developed countries is generally about 50 percent and has reached a high of 80 percent in some but is only 10-30 percent in Anhui Province. We should now stress focusing on the technical transformation of enterprises, clear up our accumulated and imported S&T results, formulate positive policies and measures, organize special forces and quickly popularize and apply results throughout Anhui Province in order to promote quick economic growth and an improvement of the role of S&T progress.

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NATIONAL DEVELOPMENTS

REFORMS IN SCIENTIFIC, TECHNICAL SYSTEM IN HUBEI DISCUSSED

Wuhan HUBEI RIBAO in Chinese 13 May 85 p 2

[Article by Huang Zhizhen [7806 4249 4176]: "Transform Science and Technology into Productive Forces To Stimulate Hubei's Economic Development"]

[Excerpt] In convening this provincial scientific and technical conference, our primary aims are to further disseminate and study the spirit of the national scientific and technical conference and the CPC Central Committee's "Resolutions Concerning Reforms in the Scientific and Technical System," discuss and examine issues relating to scientific and technical reforms in Hubei, unify our thinking, raise our consciousness and mobilize all our resources to develop science and technology in a way that achieves harmony with the economy and society.

1. Firmly Implement the "Resolutions" of the CPC Central Committee; Deepen Our Understanding of the Importance and Urgency of Scientific and Technical Reforms

Since the 3d Plenary Session of the 11th CPC Central Committee, our provincial economy has been getting better all the time, an achievement which cannot be separated from our efforts on the scientific and technical front. To make the most of this positive situation, we must take pains to solve problems in the scientific and technical system, which will act as an impetus to other aspects of scientific and technical work. Reforming the scientific and technical system is a vital issue which impinges on China's overall modernization plan, but it assumes additional urgency in our province. Hubei has a fairly solid industrial base and favorable industrial conditions. But some of our factories are still burdened with outdated equipment and technology. Their efficiency is low and they have a crying need for technical modernization. We have a large number of institutions of higher education and scientific research units with considerable potential. However, their enthusiasm and creativity have not been fully harnessed and many scientific research achievements have not been promptly popularized and applied in production. What has gone wrong? The answer can be found in the scientific and technical system which has acted as a barrier blocking horizontal regular interactions between science and technology, on the one hand, and production, on the other. As a result, scientific and technical achievements cannot be quickly converted into productive forces.

2. Open Up the Scientific and Technical Market; Speed Up the Conversion of Scientific and Technical Achievements into Productive Forces

Opening up the scientific and technical market and taking scientific and technical achievements into the realm of exchange is an important approach towards converting them promptly into productive forces and products and making full use of knowledge and expertise. We should consider the development of the scientific and technical market the core of scientific and technical reforms.

The key to developing such a market is liberation and invigoration, that is, we must set free our scientific and technical personnel from the trammels of conventions, and relax our grip on technical exchanges, the mobility of expertise, the mobility of experts and so on in order to let more and more scientific and technical achievements find their way into the market. The scientific and technical market should be a competitive arena open to all scientific research and educational organizations, production units, state-run and collective units and individuals, a venue where they can market their technical achievements, discuss research topics and contract for projects. We must take a variety of measures to invigorate the technical market, including technology trade fairs, key achievements demonstrations, public bidding to solve technical problems, technical stores with retail departments, technology popularization teams, etc. We must undertake a serious study of policies pertaining to the technical market. Governments at all levels should formulate policies which match their practical circumstances to nurture the development of the local technical market.

In developing the technical market, we must be mindful of the needs of the masses of rural and township enterprises, collective enterprises and small state-run enterprises, and make available to them advanced but practical technical achievements which will produce good economic results. At the same time, we must also consider whether or not the unit at the receiving end is qualified to use the achievements properly and whether the necessary equipment, technology, funds and raw materials are there. We must make over technical commodities the way we sell material commodities, with "multiple guarantees:" we must assist enterprises in solving any problems they may encounter in adopting the achievements and help train their workers to use them. In addition, we must drive home the idea of science and technology as a dynamic force and plan scientific research rationally so that it will develop in depth. In this way we can ensure the momentum for scientific, technical and economic developments.

To make the scientific and technical market flourish, we must strengthen leadership. Under the leadership of the provincial Science and Technology Commission and coordinating closely with one another, the Economic Commission, the National Defense Scientific, Technological and Industrial Commission, the Planning Commission, the Science and Technology Association and the Industry and Commerce Administration Bureau in the province should provide comprehensive guidance for the science and technical market, devise relevant measures and act as a conduit of information to stimulate its development throughout Hubei. At each level governmental, a comrade should be designated as coordinator to assume overall responsibility for this task. We should go

all out to create the facilities and venue where scientific and technical achievements can be exchanged, negotiations conducted and consulting services carried out. Our plan calls for the province and Wuhan each to put up 2 million yuan, supplemented by funds raised elsewhere, to jointly establish a provincial scientific and technical center to facilitate technical exchanges, which will be open to both Chinese and foreigners.

3. Reform The Appropriation System; Bring About the Classified Management of Funds

An important way of loosening the deadening grip of the state on scientific and technical work is to diversify funding channels and management methods in accordance with the characteristics of the different kinds of scientific and technical endeavors. At the same time, we must apply due pressure on scientific research units to spur them to take the initiative to look for research ideas in enterprises so that scientific research and production achieve an even closer union.

The provincial CPC committee and the provincial government have decided to increase the three categories of scientific and technical funding above last year's levels to reach 1 percent of total provincial spending. As the economy continues to develop and our financial capacity expands in the future, spending on science and technology will also increase steadily. To obtain higher returns on the three categories of scientific and technical funds, we should fund scientific and technical projects which will yield good economic results within a short period of time and have the capacity to pay back. On the other hand, we should make straight grants to those projects which are exploratory in nature and have a predominantly social purpose. Key research projects which are more speculative and have uncertain prospects should also be similarly funded.

Operating expenses for scientific and technical institutions are also slated to increase above last year's levels. The method of appropriations should be reformed as well. Independent research organizations engaged in developing technology should generate their own revenue by bidding for projects, contracting for research, transferring their scientific and technical achievements and offering consulting services. Appropriations earmarked for this kind of research organizations to cover their operating expenses must be progressively reduced with the aim of making them financially self-sufficient within 3 to 5 years. The money thus saved should not be returned to the public coffers but will be spent to develop science and technology. Priority will be given to scientific research units which do not receive public funds to cover their operating costs or do so only to a limited extent. Research organizations whose activities are socially oriented will continue to receive operating grants. Agricultural science institutes, forestry science institutes and aquatic products institutes below the county level must also continue to be funded by county finance agencies. These technical popularization units must go all out to turn themselves into enterprise-like economic entities so that they will gradually achieve self-sufficiency.

4. Strive to Promote Integration Among Scientific Research Units, Education Organizations and Production Units; Strengthen Science and Technology on the Forefront of Agricultural and Industrial Production

Strengthening the horizontal integration between science and technology, on the one hand, and the economy, on the other, helps stimulate science and technology, improve education and breathe life into production units. Hubei's institutions of higher education and scientific research units constitute a formidable scientific and technical force. Rapid development has occurred in all forms of technical cooperation and in all kinds of complexes combining scientific research and production. But even while we continue this kind of loose association, we must aim to achieve a more sophisticated form of integration based on the actual circumstances of the units in question. Specialized enterprises in the same category may consider setting up a complex, possibly to evolve into the industry's technical development center. Alternatively, it may gradually develop into an economic entity combining research with production. To strengthen our province's capacity for product renewal, we must take care to develop technical and economic complexes the chief mission of which will be the making of flagship products.

Industrial production units should enhance their ability to absorb and develop technology. Hubei's enterprises, which have been relatively weak in this regard, must gradually set up their own technical development organizations, step up investments in expertise development, make good use of their skilled workers' specialties and launch a broad-based technical modernization effort involving the masses. We must encourage enterprises to adopt new technical achievements. In line with their actual circumstances, enterprises should work out a method to reward the innovative and creative, thereby mobilizing the enthusiasm of the broad ranks of workers and creating a positive atmosphere in which everybody takes an interest in science and technology.

It is an objective requirement of rural economic development that we strengthen scientific and technical work on the agricultural forefront. We must rationalize the internal mechanism of agricultural scientific research, continue to focus on the science and technology of grain, cotton and oil crop cultivation, vigorously strengthen the technology of diversified operations and come to grips with the popularization of agricultural technology. Agrotechnical stations at the grassroots must press ahead with the technical responsibility system whereby compensation is calculated with reference to economic results, make effective use of agrotechnical households and complexes linking technology and production, encourage the broad masses of peasants to use technical achievements so as to become rich through industriousness and science and technology, and promote the all-round development of the rural economy.

As the open door policy becomes more thoroughgoing, we must integrate technology with trade. In importing foreign technology, enterprises must consider carefully their own ability to absorb such technology. There should be a close link between the equipment and technical software we purpose.

5. Reform the Management System of Scientific and Technical Personnel; Mobilize Their Enthusiasm and Creativity

Hubei's half a million scientific and technical workers make up a strong contingent which has contributed immensely to the province's economic construction for many years. However, the contingent still has many shortcomings; for example, its academic structure, professional mix and age composition are not rational and some sectors, lacking successors to its present generation of technical and technical workers, sorely need an infusion of scientific and technical talent. To develop a new generation of scientific and technical personnel, we must explore every channel, use every means and work at every level to make our education system more responsive to our needs. We must create an environment where scientific and technical comrades can update their skills through continuing and advanced studies and training. This issue is of strategic importance in invigorating Hubei's economy and science.

Essential to mobilizing the masses of scientific workers' enthusiasm and creativity is a determination to end the wasting of talent as a result of overstaffing; abolish the antiquated system of "ownership of experts by departments or units;" reform the uniform planned allocation system by combining it with open recruitment; promote the rational mobility of scientific and technical personnel; and encourage and support various specialized professionals to go to the villages, remote mountainous areas and collectively owned units. Localities and units with a shortage of experts should draw up varied, flexible and imaginative policies and measures to attract them. On the other hand, localities and units where experts are relatively plentiful should facilitate and support their rational mobility. As a policy, the encouragement of expert mobility is correct. As for the detailed problems which arise in the course of implementation, they must be and can be solved. Organization, labor and personnel and scientific and technical cadre administration departments must come up with effective measures as soon as possible to ensure that expert mobility work develops properly.

Also essential to mobilizing scientific and technical workers' enthusiasm is a continuing effort to implement the policy on intellectuals. We should permit a scientific and technical worker to engage in scientific and technical work and offers consulting services in his spare time, provided that he eagerly undertakes various planned assignments in his unit and diligently completes them. To permit such a practice is to contribute to the exchange of expertise and tap potential talent. We should also liberally reward scientific and technical workers who have made significant contributions.

6. Strengthen Leadership; Ensure Reforms in Our Scientific and Technical System Proceed Smoothly

Leaders at all levels should tackle scientific and technical reform the way they tackle economic reform -- seriously. They should conscientiously examine new conditions and problems which occur in the course of reform and solve them equally conscientiously. Leading comrades at all levels and in all departments should personally be in charge of one or two aspects of reform,

familiarize themselves with them and throw their weight behind them. Science and technology commissions in some prefectures, municipalities and counties are understaffed on the administrative side. I would like to ask them to plan comprehensively so that this situation can be properly rectified.

Reforms in the scientific and technical system impose even more stringent demands on the work of science and technology commissions at all levels. As an integrated functional government agency overseeing science and technology, the science and technology commission should take the initiative to be a good adviser and assistant to the party committee and government. In the course of reform, it must take the lead to abolish every antiquated rule and pioneer new regulations in order to satisfy the needs of the new scientific and technical system. Science and technology commissions at all levels must strengthen their overall management of scientific and technical work, draw up a science and technology development plan, review the locality's economic development plan from a science perspective so that it dovetails with the science development plan, including the planned application of scientific and technical achievements. To formulate regulations which meet local needs and ensure a healthy course for scientific and technical reforms, we must strengthen research in science and technology policymaking. We must broaden our vision of reform, taking in the broad picture instead of confining our attention to one or two issues.

Reforming the scientific and technical system demands that the Science and Technology Commission, Economic commission and Planning Commission cooperate closely with one another. Their joint deliberations and consultations are mandatory when a large construction project, a major technical import or an important technical modernization plan is at stake. In addition, they must seek out experts' opinions and evaluations. If the "three commissions" manage to coordinate their work, the longstanding schism between economic development planning and science and technology development planning can be bridged. Departments related to the national economy, such as finance, tax, prices, and industry and commerce should study the new demands posed for them by scientific and technical reforms and make a concerted effort to promote scientific and technical progress and invigorate the economy.

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NATIONAL DEVELOPMENTS

INTERDISCIPLINARY SCIENCE DESCRIBED

Four Modernizations' 'Brain Trust'

Beijing GUANGMING RIBAO in Chinese 17 May 85 p 1

[Article by special staff commentator Li Liying [2621 4539 5391]: "The 'Brain Trust Science' for Building the Four Modernizations"]

[Text] China's first academic symposium on interdisciplinary science was solemnly held in Beijing from 17-19 April 1985. This was a great event in the history of China's scientific development. With Qian Xuesen [6929 1331 2773], Qian Sanqiang [6929 0005 1730] and Qian Weizhang [6929 0251 7022] representing the older generation of scientists, along with 150 young and middle-aged scientists and with the enthusiastic support of the China Scientific Association, it held extensive and thorough discussions on problems such as appraisals of the formation, history, position and future development of contemporary interdisciplinary science, priority choices for China's development of interdisciplinary science and what role interdisciplinary science will play in building the four modernizations.

Interdisciplinary science has essentially appeared in a broad overlapping zone between the social and natural sciences and includes a community of newly born disciplines such as frontier, cross-section and comprehensive science. This has resulted from the development of the contemporary concepts of nature and science. According to this viewpoint, society is essentially natural, in which social phenomena are advanced natural phenomena. The research targets of natural and social science are ontologically one, i.e., material; methodologically, they are similar and interlinked. Since the appearance of the phenomenon of saturation in world science at the middle of the present century, this has determined the possibility of a horizontal transfer of the intelligence of natural scientists.

But society as a colony of people is after all the highest flowering of nature. "Some of the history of social development is basically different from the history of natural development." "Those who carry out activity in the field of social history are people who are conscious, who contemplate or who rely on intense emotions and seek certain goals; nothing occurs without conscious intent or anticipated goals." ("Selected Works of Marx and Engels" vol 4 p 243)

Thus, interdisciplinary scientific research is different from that of purely natural or social science. It must be decisively governed by certain social and historical concepts. China's interdisciplinary scientific development must persist in being guided by Marxism-Leninism and Mao Zedong Thought.

Interdisciplinary science is essentially natural, but its form is social. The condition on which interdisciplinary science relies for its existence and development is social practice. On one hand, social practice provides interdisciplinary science with a lot of vital research problems; on the other, it can also provide a social fulcrum for the materialization of interdisciplinary scientific theory. The governments of all countries have realized in this century that interdisciplinary science has a great social function in the coordinated development of a country's science and technology (S&T), economy and society. They have all invested a large amount of manpower, material and financial resources; generally established interdisciplinary scientific research organizations such as the Lande Co [5695 1795], the Yecun [6851 2625] Comprehensive Research Institute, the London Strategic Intelligence Research Institute, the Rome Club and the 17-nation International Applied Analytic Systems Research Institute; carried out comprehensive interdisciplinary research on problems of greatest interest to the contemporary world such as energy resources, water resources, grain and agriculture, population, oceans and war and peace; and acted as a "brain trust" for the social development of all countries and even the world.

China's four modernizations are a splendid achievement in the history of mankind, which afford a magnificent view. It will require not only a difficult struggle by people throughout the party and the country but also abundant material and spiritual wealth and especially interdisciplinary research and exploration by all disciplines, acting as a brain trust advisor to the CPC Central Committee and leaders at all levels. For instance, problems pointed out by the Central Committee such as "one nation, two systems" and "the open-door foreign economic policy; economic, S&T and education system reform; and population, energy resources, communications and local development strategy for all provinces, municipalities and autonomous regions all require that scientists in interdisciplinary fields engage in group research on major problems. Interdisciplinary science is indispensable to any contemporary Marxist leader who wants to lead and manage the four modernizations successfully. Interdisciplinary science can therefore be said to be the "brain trust science" for building the four modernizations.

Let us raise both hands to greet the coming of a new age in the vigorous development of China's interdisciplinary science!

Theory, Research Prospects

Beijing GUANGMING RIBAO in Chinese 17 May 85 p 2

[Article by Qian Xuesen [6929 1331 2773]: "Interdisciplinary Scientific Theory and Research Prospects"]

[Text] First, what are overlapping disciplines: I think that so-called interdisciplinary science refers to a series of newly born disciplines which have grown out of an overlapping zone between natural and social science.

Some people think that overlapping disciplines seem generally to be somewhat irregular. In fact, it is generally acknowledged that so-called regular disciplines such as civil, electrical and hydraulic engineering also overlap and include both natural and social science. The overlapping area of a large construction project such as the Sanxia Hydroelectric Station is even greater and problems such as peasants moving, land being flooded, fish migration and shipping navigation must all be considered. It is thus clear that all engineering technology must consider economic, production and social problems and that none of them is called an overlapping discipline.

Our understanding in this area is inadequate. Not long ago, we had a comrade who went to the U.S. to work in a computer company. When introducing their new products, a department head of the company first described how products were marketed and their economic results after they left the factory; only after establishing this position did he discuss how they solved technical problems. This caused our comrade to feel that in comparison, our scientists and technicians do not operate in this manner but mainly discuss technical problems regardless of whether their products are economical or not. It cannot be said that this is not a disparity. It may be said that this was possible in the past, but since the party Central Committee published its documents on economic and science and technology (S&T) system reform, it will not do for our comrades who are engaged in engineering technology still not to consider economic and social problems. Engineering technicians should study Marxist political economy, which is an important guiding principle for the age of interdisciplinary science.

Interdisciplinary science is an especially broad and important scientific field with a very great future. It was possibly not at first understood or approved of by some people, but it has finally been able to prosper. For instance, this was the historical fate of systems engineering in Cuba. It was criticized during the years of upheaval, but under the excellent conditions since the 3d Plenum of the 11th CPC Central Committee, although not everyone at first understood it too well, it was accepted by everyone in less than 5 years. Moreover, all party and national leaders have accepted and used the concept of systems engineering.

Based on a further analysis, we have discovered that interdisciplinary science also has its position in the S&T system structure. I have said that not only does mankind have the two major branches of natural and social science but, juxtaposed with them, are also the six branches of mathematical science, systems science, thought science, physiological science, military science and literary and artistic theory. I have recently discovered that there still seems to be one missing; thus we should add behavioral science. Thus, I have classified modern science into nine disciplinary branches. Is there overlapping between all disciplinary branches? Obviously there is, since mankind's knowledge and modern science are a whole. In reference to the actual application of these nine sciences, there is even more overlapping between them. Therefore, the development of interdisciplinary science is a historical necessity having great vitality.

Second, Marxist philosophy must be used as a guide to develop interdisciplinary science. I think that all of the nine branches of the modern S&T system structure are closely connected to the epitome of mankind's scientific knowledge, Marxist philosophy. In other words, each of these scientific branches has its respective science linking it to Marxist philosophy. The linking science of natural science is natural dialectics; that of social science is historical materialism; that of mathematical science is mathematical philosophy; that of systems science is systems theory; that of thought science is the theory of knowledge; that of physiological science is the man-nature concept; that of military science is military philosophy; that of literary and artistic theory is Marxist aesthetics; and finally behavioral science also definitely has a behavioral science philosophy linking it to Marxist philosophy. It can be understood that all of these linking sciences are partially formed on the foundation of Marxist philosophy. Together with the heart of Marxist philosophy, dialectical materialism, they constitute the Marxist philosophical mansion.

We in China enjoy the exceptional advantage of being able to use Marxist philosophy to guide our work. Based on my personal experience, I indeed thoroughly understand that Marxist philosophy is certainly a treasure and a powerful weapon. When engaging in scientific research (including that in interdisciplinary science of course), abandoning this treasure would indeed be too foolish! If we can do a good job of using Marxist philosophy in interdisciplinary scientific research, the development and future of interdisciplinary science in China will be bright. This is inevitable and beyond doubt.

Scientists' Social Responsibility

Beijing GUANGMING RIBAO in Chinese 17 May 85 p 2

[Article by Qian Weizhang [6929 0251 7022]: "Interdisciplinary Science and the Social Responsibility of Scientists"]

[Text] This is a discussion of my views on the problems of why we must develop interdisciplinary science and the social responsibility of scientists.

Everyone knows the view that holds that science is an activity of mankind to probe the mysteries of the objective world. Nature, society and the ideas in man's brain are particularly complex and can in fact be regarded as an extensive and generally connected continuum. This determines that the scientific knowledge used to explore this continuum should also be continuous. For instance, judged from a scientific perspective, in the continuum from inorganic macroscopic action (motion) to microcosmic action (motion), then a gradual transition from microcosmic action to individual action by organic life and finally to population behavior, the action of the first half is studied by natural science and the latter population behavior by social science. I think that this knowledge connects natural and social science. For the convenience of study, mankind has divided it into many different disciplines, each of which is only a specific part of the knowledge process of the whole continuum. So-called old and new disciplines are nothing but the parts which were developed at an early stage and those which are now just being newly developed. The present overlapping disciplines are a stage of and positions in the continuum. Many of these positions are now still empty and the development of interdisciplinary science is precisely in order to fill these gaps.

Engineering technologies are all overlapping disciplines and can also be called comprehensive disciplines. The so-called study of engineering refers to the knowledge which uses all of our presently known technology to accomplish certain tasks such as construction, manufacturing or various other tasks. In that case, what is technology? Technology refers to the art and knowledge of using natural laws based on science plus man's strength. Thus, technology is used in all engineering and is not necessarily very comprehensive; that which is extremely comprehensive is engineering. Engineering scientists must consider the economy, but what our technical education precisely lacks is economic education and this is a major reason why economic problems often appear and economic losses are often created in many of China's departments.

All engineering must stress overall results and this requires not only a study of economics but also a knowledge of other relevant social science categories. In fact, all leaders and managers comprehensively use all natural and social science disciplines, i.e., they comprehensively use relevant natural and social science theory and technology to accomplish the work of certain government departments or to solve problems in certain branches of society.

But all those who teach in schools now specially stress and overemphasize specialties. In fact, in constant scientific development and change, overregulation may be divorced from reality. Many disciplines in present schools were regularized in the 1950's and have long been unsuited to the actual conditions of the present four modernizations. On the one hand, many new overlapping disciplines have appeared which are not taught in schools; on the other, specialties are too obsolete and specialized and insufficiently comprehensive. Engineering education is particularly insufficiently comprehensive. What we speak of as insufficiently comprehensive refers to insufficient overlapping between disciplines. If we judge the above-mentioned objective world continuum by a multi-dimensional criteria system, there are still many gaps in our education. For instance, in the 1950's we got rid of many social science engineering categories such as sociology, psychology, applied economics and commercial management.

There is nothing in the world which is unalterable, and both development and change must be stressed. Without stressing development and change, no knowledge would be able to progress. When engaging in interdisciplinary science, we must similarly stress this problem. Next, we must stress being realistic. If we are unrealistic, none of our disciplines will have vitality.

In summary, interdisciplinary science is very important and much needed for China's four modernizations. When I was young, I thought that intensive study and an understanding of a pure science would comprehensively promote scientific and thus social progress. But although 40 years of accumulated experience have made it clear that pure science must be engaged in or one is not a scientist. the social results of only immersing oneself in pure science are not necessarily 100 percent. In order to achieve full social results, you must study things in the field of social science. A scientist who has a deep sense of responsibility to China must consider problems in the field of the overlapping relations between social and natural science.

What can our interdisciplinary science be considered to have succeeded? I think that the success of interdisciplinary science is linked to that of the four modernizations. The day when China's four modernizations are most successful will be the time when our interdisciplinary science is generally accepted by the people. I believe that this is suited to China's social development needs and will thus certainly be successful.

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NATIONAL DEVELOPMENTS

COOPERATION BETWEEN EDUCATION, PRODUCTION URGED

Beijing RENMIN RIBAO in Chinese 18 May 85 p 3

[Article by Jiang Hanzhen [5592 3211 4631]: "Cooperation Between Educational Institutions and Factories Harvests a Bumper Crop"]

[Text] The scientific research achievements of institutions of higher education have borne abundant fruits in economic construction in recent years. Preliminary statistics show that the 153 achievements developed by institutions affiliated to the Ministry of Education have been translated into an annual boost in economic results worth more than 810 million yuan.

Institutions of higher education across the country brought numerous technical achievements to the first national technical achievements trade fair. For instance, institutions affiliated to the ministry alone put up almost 1,000 achievements for trade, offered 400 technical services and placed 130 products on trial sale.

Visiting an exhibition of scientific achievements by institutions of higher education under the ministry, Premier Zhao Ziyang asked whether it may be possible in the future for a university to be integrated with a particular factory, depending on its teaching and research orientation. He also said that we must make an effort to popularize and apply scientific technical achievements. In line with the spirit of his words, institutions of higher education over the past 2 years have combined their focus on basic research with heightened efforts to develop applied research, look for research projects and popularize and apply scientific research achievements. The following new trends have appeared in scientific research at institutions of higher education:

-- Many research topics are directly geared to the national economy. As of May 1984, almost 600 long-term and 7,400 short-term technical agreements have been signed between ministry-affiliated institutions of higher education and production departments.

-- Institutions of higher education have diversified their services to national economic construction. There are now 139 organizations established by ministry-affiliated higher education institutions, combining teaching and scientific research with production, while over 1,000 people have been

retained by production units as technical advisers and deputy factory directors for technology. Also, over 2,000 training courses of various kinds have been organized with a combined enrollment exceeding 120,000.

-- There has been a steady increase year after year in the number of technical achievements transferred by institutions of higher education to national economic construction units. Of all the achievements recommended by ministry-affiliated institutions to 13 industries, 1,920 can be put to use immediately.

-- Economic results have improved markedly. Over 40 achievements yield annual economic results over 5 million yuan apiece. For example, joint research between Qinghua University and relevant factories in Beijing resulted in a new alloy weft tube which, adopted nationwide, can increase economic results by 100 million yuan and save a large amount of high-grade timber and copper. Xian Jiaotong University's low-carbon martensitic applied and theoretical research has been put to use extensively by production units in such industries as petroleum, coal, communications and weapons, improving economic results by 40 million yuan each year.

China's institutions of higher education have a total of 390,000 teaching and scientific research personnel, of which associate professors and above make up about half of all experts in China with advanced qualifications. According to the national census, intellectuals on the educational front constitute 31.9 percent of the nation's total population of intellectuals, more than any other sector in society. At the same time, higher education provides training for 80 percent of the nation's graduate students. Institutions of higher education, partly and otherwise, could claim credit for 56, or 45 percent, of the 124 natural science prizes awarded in October 1982, and have won 221, or 24.4 percent of the 906 invention awards made nationwide thus far.

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NATIONAL DEVELOPMENTS

CONTRIBUTIONS OF SPACE TECHNOLOGY TO ECONOMIC CONSTRUCTION DISCUSSED

Beijing GUANGMING RIBAO in Chinese 31 May 85 p 3

[Article by Cheng Lianchang [4453 6647 2490]: "Space Industry Serves National Economic Construction"]

[Text] With the launching of a carrier rocket in the Pacific Ocean in May 1980 and the successful launching of China's first earth synchronous tracking experimental communications satellite in April 1984, China's carrier rocket technology and satellite communications technology have advanced from the exploratory stage to one of practical application and commercialization. Today, China has the capability to manufacture and launch different kinds of multipurpose practical satellites and carrier rockets.

Space technology provides the technical basis for developing resources in outer space. With its extremely high inputs and outputs, it represents a way to increase national economic output value. Developing the national economy by using space technology enables us to skip some of the traditional developmental stages advanced nations went through, thereby speeding up our growth rate and enhancing our objective economic results. This has profound implications for the economy as well as social life.

Information is becoming more and more important in the modern economy. And space technology is the best means of gathering and transmitting information. The advantages of transmitting information using space technology are high volume, speediness, freedom from environmental interference and maximum coverage. Take the broadcasting system, for instance, If we build a high-quality broadcasting system using conventional technology complete with wiring and networking, the resultant system will cover only 80 percent of the nation's area at most at a cost of about 2 billion yuan. On the other hand, it takes only 1 billion yuan to put together a satellite broadcasting system. Not only will the latter require a much smaller outlay and can be built faster, but a satellite broadcasting system will also be able to reach the whole nation. Satellite broadcasting will universalize broadcasting and educational television in China and have a revolutionary impact by raising the entire people's cultural standard and enhancing their cultural life, especially by popularizing education and scientific and technical knowledge in rural areas. The intellectual and material wealth that can flow from such an advance is inestimable. The test communications satellite we launched last

year immediately solved the difficulty Urumqi, Lhasa and other areas experienced in receiving same-day color TV transmission from Central TV Broadcasting, and improved direct communication between Beijing and the frontier region.

As a vehicle of information-gathering, space technology has the advantages of extensive coverage, ample capacity and a high resolution ratio. An earth observation satellite equipped with a remote sensor can provide all sectors of the national economy as well as scientific research organizations with prompt and accurate data pertaining to the nation's resources and other detailed information on land and oceans. It can also monitor our land and oceans regularly. The data thus obtained can be the basis for scientific macro decision-making so that our planning will be more in line with actual conditions. All this can only help accelerate the four modernizations by making possible huge savings and improving economic results. Moreover, space technology is poised to change our traditional work procedures and industrial processes. At present, data gathered by remote-sensing satellites is commonly used in scientific research and production, including oil prospecting, geological survey, ocean and coast mapping, cartography, railroad routing, archaeology and siting a power generating plant. In cooperation with relevant departments, Capital Iron and Steel Company carried out field studies based on data from satellite remote sensing and discovered seven metallogenic areas in Beijing's outskirts. Aided by satellite data, the Ministry of Metallurgical Industry searched for metal deposits in Neimenggu, with good results. Using data gathered by satellite, the departments concerned have ascertained the patterns of silting and their interactions in the three major rivers, Huang He, Li He and Hai He, which provides a scientific basis for tackling the pattern of current in the Bo Hai and the problem of silt backflow in Tianjin's new port. In the future we may even use the unique and ideal environmental in outer space to produce new materials and conduct research in such areas as astronomy, geography, meteorology, physics, chemistry, biology, life science, medicine, and genetic engineering, research which cannot be carried out on earth. In this way we may bring about the commercialization of products which cannot be made on Earth.

As a technology-intensive industry, the space industry embraces the latest achievements in almost the entire spectrum of modern science and technology, such as automatic control, telemetry, remote sensing, temperature control, computer science, hermetization, high precision processing, special arts and crafts and testing. By applying these technologies to civilian production, we can improve the work environment, save energy, improve product quality and increase productivity.

The birth of China's space industry was nurtured by the close attention of the party Central Committee, the State Council and the Military Commission. After 30 years' development, it is now on a sound footing and has sophisticated and comprehensive technology in research, design, trial manufacturing, experimentation, production and testing, and a scientific and technical contingent made up of well-trained experts, engineers and technicians from all disciplines who are equal to the most formidable tasks. With over 4,800 scientific and technical achievements to its credit, the industry is highly experienced in the application of systems engineering to research, production

and testing and the concomitant scientific management. In recent years, the Spaceflight Ministry has entered into technical and economic cooperation with the localities, using space technology to produce a broad range of advanced equipment for certain sectors of the national economy and transferring to them many pieces of the latest technology, thereby contributing to the nation's socialist modernization.

The future of putting space technology to work for national economic construction is getting brighter and brighter by the day.

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NATIONAL DEVELOPMENTS

VITALITY OF PRIVATE SCIENTIFIC RESEARCH DISCUSSED

Beijing RENMIN RIBAO in Chinese 4 Jun 85 p 3

[Article by Gong Yu [7895 5940], Ge Yaoliang [5514 5069 5328] and Lu Jizhuan [4151 4949 0278]: "Private Scientific Research Institutes Are Brimming with Vitality"]

[Text] A host of private research institutes have sprung up in rapid succession over the past 3 years as we went about reforming the economic and scientific research systems. It was revealed at the recent national seminar on private scientific research institute management in Beijing that there are almost 10,000 private scientific research institutes of various kinds in China today. Their remarkable achievements in a short period of time have made them the focus of attention.

Shanghai delegates to the national seminar disclosed that a survey on 139 private scientific research institutes showed that about one third of them have obtained outstanding achievements. The Shanghai SC Technology Development Company, scarcely a year old, has one achievement of international standard and two others which are innovations in China. Opened a year ago, the Huajia New Technology Development Company in Beijing has completed 15 major technical projects, including one which matches the most advanced in the world. The Tension Control Research Institute, a private organization in Dalian, undertook a project to develop tension wire drawing technology, which only a few countries have mastered in the 1980's, and has so far come up with a fairly sophisticated control system. Over the past 3 years, the Industrial Design Institute in Luoyang, a voluntary association of six engineers, has been instrumental in the establishment of nine chemical plants across the country, increasing output value by 20 million yuan each year. The fact is that private scientific research institutes are right now bursting with life to the benefit of China's economic construction.

The operational features of a private scientific research institute can be summed up thus: it is a free association which picks its own management team, raises its own funds, runs and manages itself, assumes responsibility for its own losses and profits and has its own independent accounting. In effect, a private research institute must abolish the practice of "eating from the big rice pot," and each member must make the most of his initiative and creativity. He must be inspired with an innovative, pioneering spirit at all

times, constantly develop new technology and go all out to convert scientific research achievements into productive forces to ensure the survival and growth of his institute. Referring to the Applied Technology Research Institute in Hangzhou, institute director Tao Sujun [7118 4790 0689] revealed that it develops technology and consults in cold ironing liquid, electric blanket, telephone testing equipment and chemical hair-curling lotion and has been well received by small and medium-sized enterprises. Apart from making over these technologies to enterprises, the institute also helped train their workers so that the products soon took over the market. People put it graphically, "The private scientific research institute is an industrial organization which offers a 'package deal' combining scientific research, production and marketing."

Studies show that because of institutional restrictions and various other reasons, some scientific research personnel cannot give full play to their talents and expertise, while some retirees have untapped potential. Today, the private research institute provides these two groups with ample room to use their skills. There were eight engineers in Shenyang who were underused in their original units in the past 10 years or so. When they set up their own private research institute, they completed three scientific research projects in just 40 days. While he was with his original unit, a middle aged scientific and technical worker in the Modern Information Technology General Company did not have an opportunity to practice his specialty and was doing things he was not trained for. After he joined the private research institute, however, he came up with a couple of research successes in just a few months, including one involving the "high-concentration general color base" which partially fills the nation's technology vacuum. Yet another example is the Dawang Science and Technology Development Company which, with its pool of doctoral and masters candidates, constitutes a formidable force for technological progress. The Liaohai Resource and Technology Development Company in Liaoning is the brainchild of a group of retired scientific and technical workers. There are reportedly more than 5,000 retired scientific and technical personnel in Liaoning province alone. If conditions can be created for them to make use of their expertise, they will certainly have much to contribute to our science and technology. People think that private scientific research institutes present a viable approach to the development of expertise.

Private scientific research institutes are essentially geared towards urban small and medium-sized enterprises and rural and township enterprises, and most venture into scientific and technical research terrain where research organizations owned by the whole people do not care to tread. The Huadong Equipment Cleaning Company in Luwan District in Shanghai applies new technology to cleaning the piping system of refrigerators and attracts more business than it can handle. Lee's Physical Chemical Laboratory in Shanghai's Yangpu District successfully used processed plant wasted materials and other waste materials to make "plastic fiber" which can be used to manufacture inexpensive imitation redwood furniture. By making good technical omissions and remedying other deficiencies, private institutes have promoted the development of rural and township enterprises and solved a number of major problems in the nation's economy and people's livelihood. China's rural and township enterprises may be booming, but they are in dire need of technical

personnel and, with a fragile technical basis, crave science and technology. In recent years, rural and township enterprises have been developing rapidly in Jiangsu, and one reason is exactly the support by private scientific research organizations in the province and Shanghai. Huazhou Technical Information Consulting Development Company in Changzhou helped found four enterprises in the city's outskirts in only 4 months. Nanyang Technology Development Company in Shanghai's Luwen District provided technology to a lamps and lanterns factory in Changzhou, increasing its output value by more than 800,000 yuan within a few months.

As a new-born novelty, the private scientific research institute certainly has its shortcomings. Departments concerned must help and guide it to make it perfect gradually.

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NATIONAL DEVELOPMENTS

BRIEFS

INFRARED SCANNING EQUIPMENT--Shijiazhuang, 6 May (XINHUA)--China has successfully developed highly sensitive, infrared scanning equipment, composed of an infrared scanner, a signal processer, a picture, monitor, and a film projector. It can be used for military purposes, and in environmental protection, hydrogeological surveys, prevention of forest fires, and control of crop diseases and insect pests. The equipment was built by a telecommunications research institute under the Ministry of Electronics Industry, in cooperation with other units concerned. [Summary] [Beijing XINHUA Domestic Service in Chinese 0400 GMT 6 May 85 OW]

LIAONING COMPUTER TECHNOLOGY TRADE FAIR--The Dalian Dongfang Ltd Corporation, a computer technical development concern, the first joint-venture corporation in the Dalian economic development zone, and run by the five foreign and domestic enterprises, including the Dalian Branch of China National Technical Import Corporation and corporations in Hong Kong, opened an exhibition and trade fair on computer technology on 19 May. The Dongfang Ltd Corporation of Dalian is mainly in charge of developing new computer and communications technology, designing new electronic products, and signing contracts on systems projects. Since 27 April, when the corporation was opened, it has signed four contracts on technical cooperation. [Excerpts] [Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 19 May 85 SK]

BEIJING PROLOG SYSTEMS--Beijing, 3 June (XINHUA)--The CE-Prolog and the C-Prolog Systems, developed by the Computer Department of Beijing Aeronautical Engineering Institute, passed the appraisal at the ministry and institute levels on 3 June in Beijing. The appraisal was organized by the Ministry of Aeronautical Industry, [Excerpt] [Beijing XINHUA Domestic Service in Chinese 1139 GMT 3 Jun 85 OW]

BEIJING SOFTWARE FACTORY--Beijing, 6 June (XINHUA)--Beijing is making preparations to build a experimental software factory. The factory is jointly invested, and will be jointly operated, by the China Software Technology Development Center of the State Science and Technology Commission, and the Beijing Municipal Science and Technology Commission. An agreement on the project was signed in Beijing today. The project is scheduled to be completed within 3 years. Building experimental software factories is an important part of China's science and technology development and electronics industry invigoration plans. It is aimed at carrying out pilot projects for China's plan to build a technology-intensive software industry, and providing software technology and management experience. [Text] [Beijing XINHUA Domestic Service in Chinese 1547 GMT 6 Jun 85 OW]

HENAN CHINESE CHARACTER CODING--Zhengzhou, 7 June (XINHUA)--An advanced Chinese character coding program, the "Chinese Character (?Escalator Four-Corner Numerals Coding Program," [han zi ceng ci si jiao bian ma fang an 3352 1311 1461 2945 0934 6037 4882 4316 2455 2714] recently passed appraisal in Zhengzhou. Input of both Chinese characters and English words can be done with a disk. The alteration of internationally popular computers is necessary. This program was developed by 27-year old assistant engineer Chen Guobin of the Henan Provincial Planning and Economic Committee. [Summary] [Beijing XINHUA Domestic Service in Chinese 0850 GMT 7 Jun 85 OW]

BEIJING SEMICONDUCTOR RESEARCH BASE--In 1978, the State Council approved the construction of a modern semiconductor research base in the northern suburbs of Beijing Municipality. The base will be composed of 31 projects and will cover an area of 75,000 square meters. The main research building, which covers some 32,000 square meters, was recently completed. The main building was built by the No 4 Municipal Construction Company, and is so far the largest semiconductor research building in China. The Semiconductor Research Institute of the Chinese Academy of Sciences will be the occupant of the building. [Summary] [Beijing BEIJING RIBAO in Chinese 14 Jun 85 p 1 SK]

JIANGXI MICROCOMPUTER INDUSTRY--A microcomputer industry has been initially established in Jiangxi Province. The application of microcomputers has been expanding quickly and has begun to bring about marked eocnomic results and social effects. The Jiangxi Electronic Computer Manufacturing Plant produced 1,050 computers and accessories in 1984. The Jianyang Implements Plant also produced 400,000 calculators of various types in the same year. Microcomputers are used not only in industrial enterprises, but also in government offices. [Summary] [Nanchang Jiangxi Provincial Service in Mandarin 1100 GMT 2 Jul 85 OW]

CSO: 4008/1054

APPLIED SCIENCES

LASER INDUCED BIOLOGICAL HEATING ANALYZED

Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese No 11, 20 Nov 84 pp 697-700

[Article by Liu Puhe [0491 2528 0735] of the Zhong Shan Medical College: "A Quantitative Analysis on Laser Induced Biological Heating"]

[Text] Abstract: This paper gives a quantitative analysis of the vaporization of tumors by pulsed CO_2 lasers, incision by CW CO_2 lasers, tissue coagulation by argon lasers, thermal killing of cancerous cells by He-Ne lasers, and the application of heat by CO_2 lasers. Although the calculations are based on a simplified skin model, it may prove useful in clinical treatments.

The effects of the laser on a biological body include the heating effect, the pressure effect, the photochemical effect, the electromagnetic effect and the stimulation effect.[1] The most often exploited effect is the heating effect. The heating effect may result in vaporization, incision, coagulation, thermal killing of cells and local application of heat. The result depends on the wavelength of the laser, the exposure time, the power density, and the properties of the biological tissue such as reflection, refraction, absorption, scattering, transmission, density, specific heat, thermal conductivity, thermal diffusivity, thermal transport, the type, distribution, and density of pigments, the distribution of blood vessels, the speed of blood flow, laminated structure, the rate of cell division, and the metabolic state. Although there are numerous factors affecting the laser heating of biological tissues, some have principal effects and others have only secondary effects. In the space below, we shall give a quantitative analysis based on the energy relationship.

I. Using Pulsed CO_2 Laser To Vaporize Tumors

In the vaporization of tumor with a laser, the tumor absorbs the laser energy and changes it to heat, which in turn raises the temperature of the tumor. Below 100°C the heat causes a denaturization of the tissue, and above 100°C the heat causes the body fluid to boil. Because the phase change takes place quickly, the great pressure of the vapor will rupture the skin and some tissue debries will be ejected out as well.

Let the output power of the CO_2 laser be P watts and the energy distribution be gaussian, the illumination time be t seconds, the beam radius and the tumor radius be r cm, and the depth of the tumor be b cm, then, from the energy relationship, we have:

$$(1-R)Pt=\pi r^2 b\rho J(L+C\Delta T) \tag{1}$$

where R is the reflectivity of the skin surface (about 0.05 for a CO_2 laser), ρ is the density of the tissue (1.2 g/cm^3), J is the mechanical equivalent of heat (4.18 J per calorie), L is the latent heat of the tissue (540 Cal/g, assume L of tissue is the same as that of water at 100°C), C is the specific heat of the tissue (0.86 Cal/g °C), ΔT is the rise in temperature for the tissue to reach the boiling point (100°C - 36.5°C = 63.5°C). Substituting the known values into Equation (1), we have

$$Pt=9.87\times 10^4 r^2 b \tag{2}$$

or

$$\left(\frac{P}{\pi r^2}\right)t=3.14\times 10^4 b \tag{2'}$$

From Equation (2), the energy required to vaporize a tumor is directly proportional to the volume and Equation (2') shows that the energy density is proportional to the depth. For r = b = 0.2 mm and P = 60 W, the vaporization time is 13 milliseconds.

If the tumor is a hemispherical body with a radius r, then,

$$(1-R)Pt=\frac{1}{3}\pi r^3\rho J(L+C\Delta T) \tag{3}$$

Using the known constants, we have

$$Pt=6.0\times 10^4 r^3 \tag{3'}$$

For r = 0.2 mm and P = 60 W, the vaporization time is 8 ms.

The boiling actually takes place at a temperature above 100°C because the skin plays the role of the lid of a pressure cooker. (We used 100°C in the calculation.) Continued absorption of heat increases the temperature of the body fluid, and the vapor pressure even further and the rupture of the skin and vaporization of the tumor occurs only when the pressure exceeds the elastic limit of the skin. If the heating is carried slowly, the tissue will disintegrate after it loses all the water content and may even carbonize, then the temperature may reach 1000°C.

II. Incision by CW CO_2 Laser

From the above analysis, one can see that, for a light beam with diameter 2r, it takes t seconds to reach a vaporization depth (incision depth) of b centimeters. On average, the incision speed v is given by

$$v=2r/t\approx 6.42\times 10^{-4}\times\frac{P}{\pi r^2}\times\frac{r}{b} \tag{4}$$

For r = 0.2 mm, incision depth = 1 mm, and P = 60 W, the incision speed v is 0.62 cm/sec.

It should be pointed out that the incision ability of a laser depends strongly on the accuracy of the focusing and the focus should be precisely at the flat incision plane.

III. Coagulation With a Neodymium Laser

Neodymium lasers are most suitable for coagulation of tissue because it has a small coefficient of absorption (11 cm^{-1}) and 98 percent of the light reaches a penetration depth of $d = 4/11 \approx 0.36$ cm. It is known that protein coagulates after 1 minute at 40-50°C. In the absence of phase change, the higher the temperature, the faster the coagulation. Substituting ΔT by 63.5°C and L by zero in Equation (1), we have

$$Pt = 9.06 \times 10^3 r^2 b \tag{5}$$

For r = 5 mm, b = 2 mm, and P = 1 W, the laser coagulation is 7.5 minutes. Incidently, the medium and small blood vessels are often sealed off with a 12 W/cm^2 defocused laser during laser incision.

IV. Thermal Killing of Cancerous Cells With a He-Ne Laser

A new method for treating cancer developed in recent years is the thermal killing of cancerous cells by local irradiation with a laser. The optimum method is to maintain the temperature at the peripheral of the cancerous cell at 43°C for 60 minutes (no limit on the center temperature). In the 41-45°C range, cancerous cells are more sensitive to heat than normal cells. At 50°C, both the cancerous cells and the normal cells will be killed thermally indiscriminately.

The thermal distribution in the tissue may be found from the equations below:

$$\begin{aligned} J' &= -H_c \operatorname{grad} T \\ \operatorname{div} J' &= -\rho_c \frac{\partial T}{\partial t} + q \end{aligned} \tag{6}$$

where J' is the thermal flux vector, T is the temperature rise, H_c is the thermal conductivity and q is the thermal energy. The steady state temperature distribution is

$$T = \frac{-\beta I_t}{H_c(\beta^2 - \beta_h^2)} \cdot e^{-\beta x} + C_1 e^{\beta_h x} + C_2 e^{-\beta_h x} \tag{7}$$

where β is the total optical attenuation coefficient, β_h is the thermal attenuation coefficient, $\beta_h = \sqrt{G/H_d} = 1/d_h$, G is the rate of blood flow, H_d is the thermal diffusivity, d_h is the penetration depth, and C_1 and C_2 are constants. The boundary condition for a semi-infinite medium with negligible surface heat loss is

$$T = \frac{\beta I_t}{H_c(\beta^2 - \beta_h^2)} \cdot \left\{ \frac{\beta}{\beta_h} e^{-\beta_h x} - e^{-\beta x} \right\} \tag{8}$$

The penetration depth of a 633 nm He-Ne laser is 2 mm. Using a thermal conductivity $H_c = 4 \times 10^{-3}$ W/cm °C and a set of values for the penetration depth d_h, Equation (8) can be solved graphically and the greater blood flow rate, the smaller the temperature rise; and the deeper the location, the smaller the temperature rise. It should be pointed out that the transmitted power density may be much smaller than the incidence value; for example, the reflection coefficient is 0.18 for pig liver and 0.60 for cattle brain.

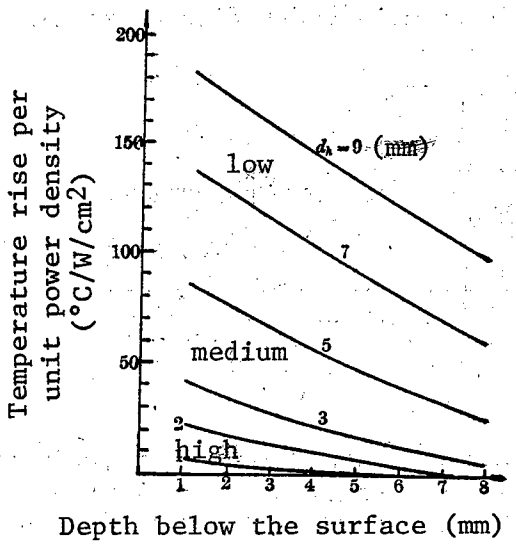

Figure 1

Table 1 lists the depth for the thermal killing of cells for different transmitted power density and blood flow rate. Using a He-Ne laser with a power density of 100 mW/cm^2, an exposure time of 15-60 minutes and at a low blood flow rate, the thermal killing depth may reach 10 mm. Conversely, at a high flow rate, only surface cells can be killed. At a transmitted power density of 50 mW/cm^2, the thermal killing depth is about 5 mm at a low blood flow rate and is negligible at a medium or high blood flow rate. For the human body, the blood flow rate is high in the kidney, medium in the skin and low in the muscle and fat.

Table 1. Depth of Thermal Killing of Cells Using a He-Ne Laser (Wide beam, initial temperature = 37.5°C)

Transmitted laser power density (mW/cm^2)	Effective exposure time (min)	Minimum temperature required (°C)	Temperature rise per unit power density (°C/W/cm^2)	Depth (mm)		
				Blood flow rate		
				Low	Medium	High
100	60	43	55	9-13	0-4	~0
50	60	43	110	4-7	~0	~0
100	30	44	65	8-12	0-3	~0
50	30	44	130	2-5	~0	~0
100	15	45	75	7-10	0-2	~0
50	15	45	150	0-4	~0	~0

V. Application of Heat With a CO_2 Laser

The light from a CO_2 laser is essentially absorbed by the 0.2 mm skin layer and causes a temperature rise. What is the best skin temperature during the application of heat? The purpose of heat application is naturally not to damage the tissue. Figure 2 shows the critical value for heat application. The region above the curve corresponds to tissue damage and the region below the curve corresponds to no damage to the tissue. As can be seen, the tissue can stand a higher temperature at a shorter exposure time.

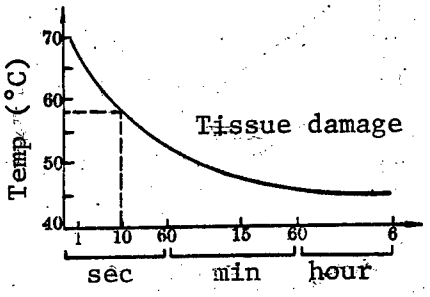

Figure 2

The time of heat application is usually long, say, 60 minutes. According to Figure 2, the temperature should not exceed 46°C. For long exposure times, heat losses due to convection, evaporation, radiation, blood flow, and conduction through the tissue cannot be ignored.[3,4] When the heat input (not including body heat) is equal to the heat loss (not including conduction through the air because the air has a small thermal conductivity), the skin temperature remains constant.

Assuming the skin temperature to be achieved is 46°C, the body temperature is 37°C, and the room temperature is 15°C, the heat loss by convection is

$$Q_1 = H_v(T_1-T_0) \tag{9}$$

where Q_1 is the heat loss per second per square centimeter, H_v is the coefficient of convection (see Table 2), T_1 is the skin temperature, and T_0 is the ambient temperature.

Table 2. Thermal Transport Coefficients

Radiation	0.554×10^{-3} W/cm^2 °C
Convection	$0.166 \times 10^{-3}\ \Delta T^{1/4}$ W/cm^2 °C
Conduction (tissue)	1.2×10^{-3} W/cm °C
Conduction (air)	0.2×10^{-4} W/cm °C
Evaporation	0.0268×10^{-3} W/cm^2 torr

The heat loss due to evaporation is given by

$$Q_2 = H_e(P_1-P_0) \tag{10}$$

where H_e is the heat conductivity of the steam, equal to 0.0268×10^{-3} W/cm^2 torr, P_1 is the saturated vapor pressure of water at 46°C, equal to 75.65 torr, and P_0 is equal to 12.79 torr (at room temperature).

The heat loss due to radiation is

$$Q_3 = H_r(T_1-T_0) \tag{11}$$

where H_r is the radiation transport coefficient, 0.554×10^{-3} W/cm^2 °C.

The heat loss due to blood flow is, for 1 cm^3 of tissue,

$$Q_4 = 4.18Gc_b\rho_bV(T_1-T_2) \tag{12}$$

where G is the rate of blood flow in the skin (in the 2.5-8.3 range). The equation above takes the average value of 5.4×10^{-3} cm^3/g °C, c_b and ρ_b are respectively the specific heat (0.92) and density (1.05) of blood, T_1 = 46°C, T_2 = 37°C, and V is the volume of the tissue at 46°C, estimated to be 2×10^{-2} cm^3.

The heat loss through the conduction of the tissue is

$$Q_5 = H_c(T_1-T_2)/d \tag{13}$$

where H_c is the thermal conductivity, equal to 1.2×10^{-3} W/cm^2 °C, and d is the penetration depth of the light.

The thermal diffusion length, in centimeters, is

$$s = \sqrt{4\ H_d t} \tag{14}$$

where t is the time required by the thermal diffusion length s, H_d is the thermal diffusivity of the skin and the tissue, taken to be 1.2×10^{-3} cm^2/sec, and the exposure time is taken to be 1 hour. On the other hand, if the exposure time is 1 ms, s is very small (about 7 μm), and the laser induced thermal reaction is local. The heat diffuses not only if the exposure to the laser is continuous.

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9698
CSO: 8111/1083

APPLIED SCIENCES

APPLICATION OF HEAT-SCAN NDT TO INSPECTION OF ADHESION OF SOLID ROCKET MOTOR PROPELLANT TO ENVELOPE

Harbin HARBIN GONGYE DAXUE [JOURNAL OF HARBIN INSTITUTE OF TECHNOLOGY] in Chinese No 1, Mar 85, pp 74-83

[Article by Tian Enrui [3944 1869 3843], Wu Jie [0702 2638], Pi Mingjia [4122 0682 0859]]

[Summary] Heat-scan infrared nondestruction testing technology is a new and effective method to inspect solid rocket motors for defects in propellant adhesion to the envelope. In this article, the basic principles of heat-scan infrared NDT are introduced. Specifically, the theoretical basis of the heat-scan method is to detect internal defects of an object by measuring the infrared radiation from its surface and calculating the surface temperature distribution so that distortions in temperature pattern can be identified.

To illustrate this technique, the HT-1 infrared NDT machine built by the Harbin Institute of Technology is introduced, and test results of using the HT-1 to inspect adhesion defects between the solid rocket motor propellant and the envelope are presented. The selection of test parameters which include the amount of heat injection, the scan velocity, the delay time, and the propellant surface conditions are discussed. The procedure for recognizing the defect signal and determining its location and size is also described. In conclusion, it is pointed out that the simplicity and speed of this method to evaluate the quality of adhesion of propellant to the envelope will have a positive impact on propellant production technology.

Figure 1. Coordinate Transformation

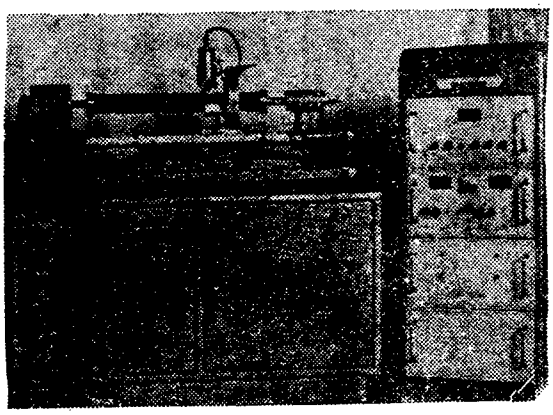

Figure 2. Photograph of the HT-1 Machine

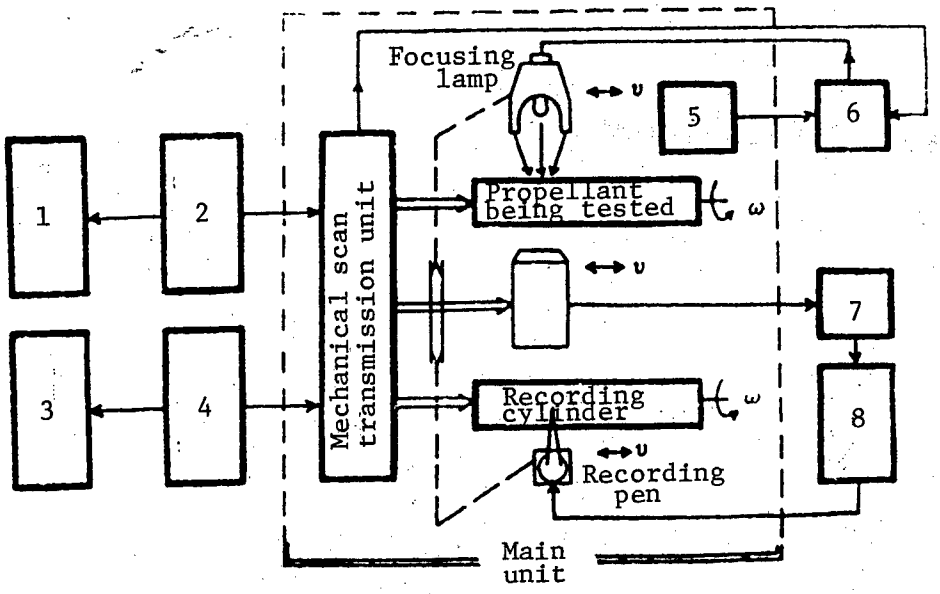

Figure 3. Block Diagram of the HT-1 Machine

Key:
1. Angular scan-velocity display
2. Angular scan-velocity drive circuit
3. Axial scan-velocity display
4. Axial scan-velocity drive circuit
5. Limit switch
6. Heat source control
7. Amplification circuit
8. Recording pen drive amplifier

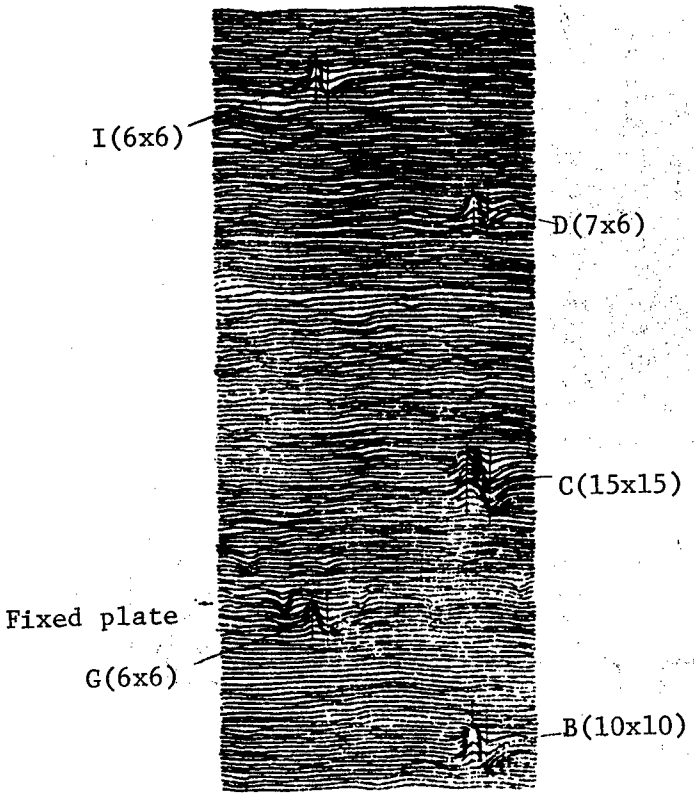

Figure 4.

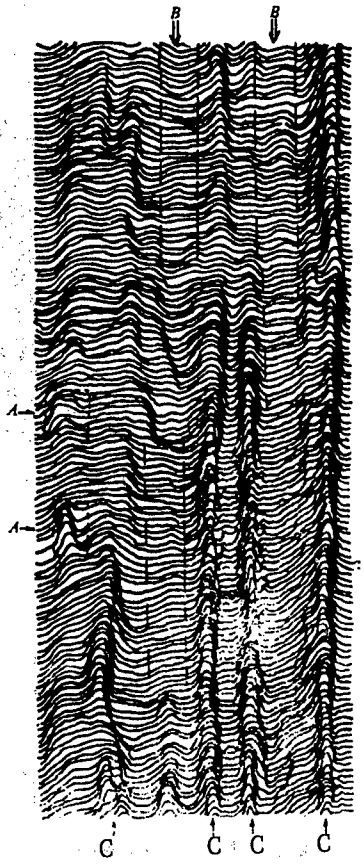

Figure 5.

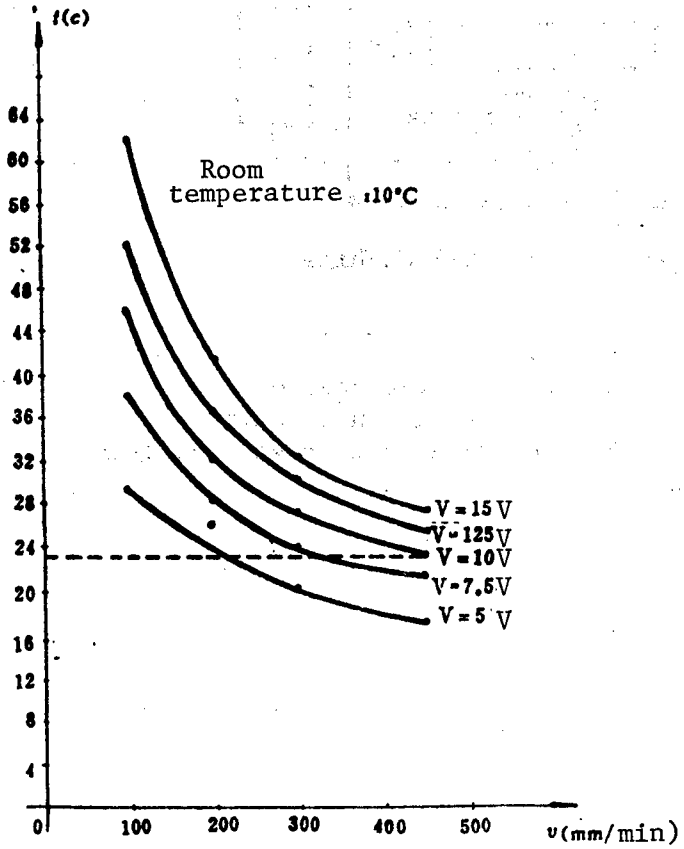

Figure 6. t-v Curve for the Interior Surface of the Envelope of 2# Propellant

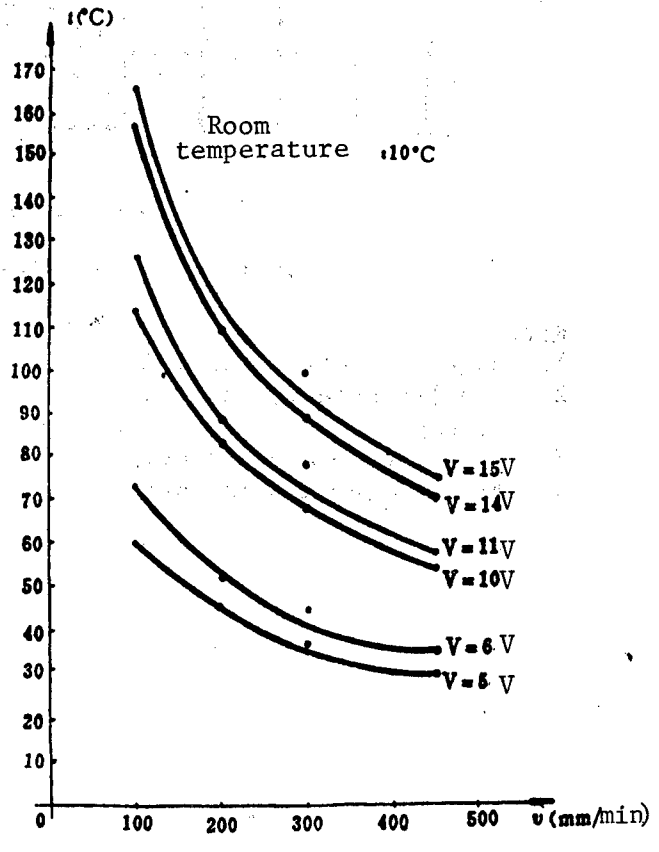

Figure 7. t-v Curve for the Exterior Surface of the Envelope of 2# Propellant

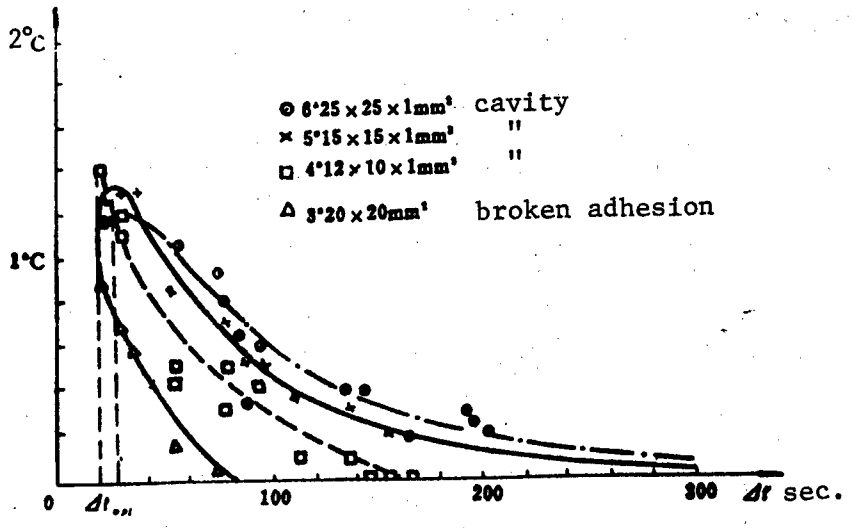

Figure 8. Heat-Scan Infrared Measurement of Defects of the 620-2 Test Sample

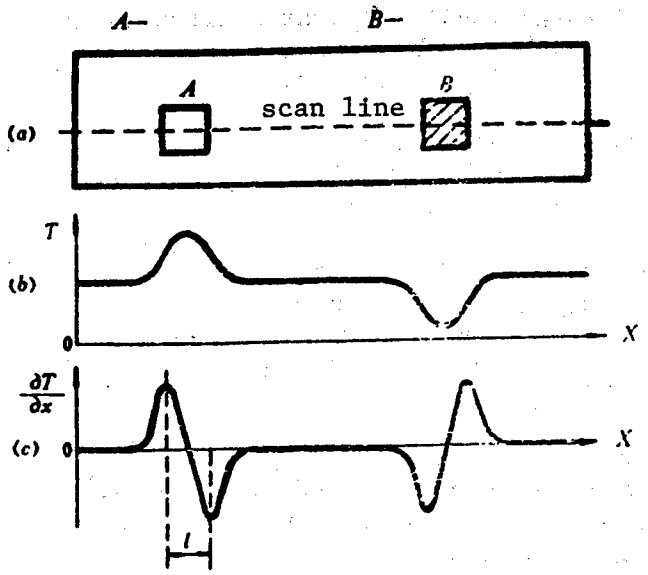

Figure 9. (a) Diagram Showing the Defects at Propellant Interface
(b) Distribution of Measured Temperature
(c) Distribution of Temperature Gradient

Key: A--thermal resistance type defect
B--thermal conductance type defect

3012
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APPLIED SCIENCES

ICS FOR DJS060 MICROCOMPUTERS PASS APPRAISAL

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 8 Feb 84 p 1

[Article: "Liao He Experimental Institute Gets Quick Results in Developing Microcomputers, Five Large-Scale Integrated Circuits Developed in 1983"]

[Text] The Component Industry Management Bureau of the Ministry of Electronics Industry recently convened a scientific research results appraisal meeting in Shenyang and approved 5 large scale integrated circuits developed in 1983 by the Liao He Experimental Institute for use in microcomputers. The five circuits are: LM68B00, LN68B21, LN6845 and LN6880.

The LN[M?]68B00 is an 8-bit parallel processor. Its functions are the same as the MC6800 and can work at a clock frequency less than 2 MHz. Its successful development may double the speed of the present DJS060 series microcomputers.

The LN68B21 is an 8-bit high speed external interface adapter. It has two 8-bit bi-directional busses and four control lines connecting the microprocessor with peripherals. Four control/interrupt lines may be programmed for each control mode. This circuit can operate at 2 MHz.

The LN6862 is a 1200/2400 baud differential phase-shift key-controlled modulator. It has the modulation and control functions necessary for realizing serial digital signal of a voice grade channel, has 511-place CCITT test code and TTL compatibility, can transmit transport markings and response to signals and is an important interface circuit for communications systems.

The LN6845 is a CRT controller which can carry out the interface functions between a raster scan type CRT display and the microprocessor. By programing the internal register it can realize character and image display with CRT screen densities of 80x24, 72x64, and 132x20.

The LN6880 is a four three-state output bus transceiver. This circuit has a high impedance PNP transistor input, using Schottky diode clamping high speed operation can be realized, and is used for data receiving and sending between the microprocessor and the bus and between the peripherals and the bus.

The successful development of these large-scale integrated circuits marks new breakthroughs in certain areas of industrial technology by this institute and is used for data receiving and sending between the microprocessor and the bus and between the peripherals and the bus.

8226
CSO: 4008/166

APPLIED SCIENCES

MICROCOMPUTER APPLICATIONS SUMMARIZED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 8 Feb 84 p 8

[Article: "Microcomputer Application Choices (16)"]

[Text] *The Chengdu Institute of Computer Application of the Chinese Academy of Sciences developed a guest management information system for the Jinjiang Hotel. This system is based on a CROMEMCO M-5 microcomputer and consists of 5 modules, namely, tour group and conference management module, service station management module, routine operations module, and DBA module. The system is written in COBOL and the target program can be about 200 K. Because the system's data document organization is in data library network form, it is easy to take care of problems of real time high demand, large volume of data and shared data.

*The Guizhou State-run Xinfeng Instrument Plant has designed a microcomputer modulating signal source. This signal source is composed of a CMC-80 microcomputer with an interface circuit and software. Regularity of changes in the modulating signal which is output can be selected on the keyboard by the operator. Changes in the frequency and length of the output signal also can be selected by software or by adjusting a few component parameters in the interface circuit, the frequency beat change rate can be as fast as 12.5 KC.

*The Beijing Automation Institute of the Ministry of Machine-Building attached a domestically produced WZG-200 light flux meter to an M6800 microcomputer data processing system to automate mass content analysis calculations and improve the speed and precision of analysis. The system uses photoelectric isolation, has a diagnostic program, and integrated applications software; for these reasons it has good interference resistance ability, its reliability and maintainability are good, and it can be extended for use in metallurgical, machine building, and geological departments.

*The Guangzhou Nanyang Electric Apparatus Plant and the Guangdong Industrial College cooperated to build a WGK-130 industrial control computer using an MC14500 one bit microprocesor as the central processing unit and a 2716 EPROM memory. This is a programmable automatic control device used for switching variables. It can replace completely sequential control devices and breaker

devices, and can be widely used in such industrial departments as machine building, chemical engineering, light industry, electric power, metallurgy, and electronics for mass control of numerous machines or automation of individual machines for positioning, time, and counting and for centralized control of medium and small scale production lines.

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APPLIED SCIENCES

MICROCOMPUTER APPLICATIONS IN STEEL SAMPLE ANALYSIS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 8 Feb 84 p 8

[Article: "Using Microprocesors to Help Steel Sample Analysis "]

[Text] The Chengdu Electronics Research Institute and Branch Mill No 1 of the Ministry of Metallurgical Industry's Changcheng Steel Mill cooperated to connect a computer to the back of a spectroscope and jointly developed an automatic microcomputer-aided blast furnace steel sample analysis reporting device. It has been in test use since December, 1982 and has been working well with good economic results.

Using this device to analyze a test sample of high alloy steel takes 15 minutes less than the old method, and 5 minutes less for medium and low alloy steel. From January to October, 1983 this system was used to coordinate refining of high alloy steel and lowered consumption of electricity per ton from 606 kwh to 578 kwh, an average saving of 28 kwh of electricity per ton. In the first 10 months of 1983, a total of 8,295 tons of high alloy steel was refined, with a saving of 23,226 kwh, with a value of 18,558 [sic] yuan (calculated at 8 cents per kwh), and at an annual output of 80,000 tons of steel, in one year 2.24 million kwh could be saved with a value of 179,200 yuan.

Recently, the Provincial Electronics Industry Office and the Provincial Metallurgical Industry Office organized a technical assessment of this system at a branch mill of the Changcheng Steel Mill. The appraisal meeting felt that: using a microcomputer for data processing and a domestically produced YD-130 narrow printer as an output terminal and printing the results at the blast furnace site was a definite advance. The applications software for this system has a high curve fit precision, and in terms of production practice added the functions of lower limit processing, sitting correction, and overall correction, improved the precision of analysis and satisfied production demands better.

This system requires low investment, has reliable function stability, shortens sample analysis time, prolongs the life of steel-smelting furnaces, is beneficial in improving the use rate of equipment and production efficiency, saves on power and other production expenses, can guarantee smelting quality, and has obvious economic benefits and promotion value.

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APPLIED SCIENCES

CYG-1321 MODEL LASER PRINTER

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 8 Feb 84 p 7

[Article: "CYG-132A Model Laser Printer Design Model"]

[Text] At the end of last year, the CYG-1332A laser printer jointly designed by the Beijing Industrial University and the Fulaerji Electronics Instrument Plant, Qiqihar [Heilongjiang] was officially set and will soon go into small batch production.

The main features of this laser printer are that it uses the advanced technology of laser modulation, laser scan, xerography, and microprocessor control, and thus print quality is higher than existing domestic impact printers and it is faster and quieter. Its print speed is 1,200 lines per minute at 231 characters per line. Characters are dot-matrix on an 11x14 grid for characters and 15x14 for Chinese ideographs. Character size can be changed and tables can also be printed. Noise is less than 60 decibels.

This machine uses a CAD technical standard model for the drive source of the laser's high frequency modulation signal and the laser's multibus combined scan acoustooptic modulator and matches it with a special raster synchronous and distortion reducing circuit, thus there are clear improvements in forming lines, columns, low distortion, and stability.

Inside the machine a TP801 single board controller is used so the user can rewrite the control program and character matrix, and it has the capability of making tables, reprinting and certain troubleshooting and indicating,. It has a standard interface and can be directly connected with most domestically produced computers.

8226
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APPLIED SCIENCES

NEW INPUT METHOD FOR CHINESE CHARACTERS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 8 Feb 84 p 7

[Article by Liu Weichang [2692 4850 7022] Beijing Municipal Institute of Computer Technology: "A New Method of Keying In Chinese Characters; Computer Assisted Chinese Character Input Method"]

[Text] The methods China uses for inputting Chinese characters are somewhat less than ideal: the operator must memorize tedious and boring encoding rules and the computer which is good at mechanical memorizing will not take this into consideration. For people who can be used for a wide range of things (not including people with specialized training) learning a Chinese character input method should turn this situation upside down: the tedious code should be remembered by the computer and the user not have to bother with this.

Entering Western language text at the keyboard is not at all difficult for the user and this is because the process of entering Western language text is identical with the everyday process of writing Western language text. An ideal Chinese character input method should establish for the operator an environment very close to the process of writing Chinese characters so that any person who can write Chinese characters can easily and freely converse with the computer.

To establish a friendly input environment for the user this Chinese character input method should be able to have the computer promptly alert the user, eliminate superfluous strokes in the Chinese character and help people resolve serious problems of encoding Chinese characters. In addition, it should also be able to rely on the artificial intelligence of the computer to distinguish Chinese characters with the different stroke orders and different compounds employed by different users. From this it is clear that this computer-assisted Chinese character input method would make Chinese character input a man-machine dialogue process unlike the present force-feed process in which the user inputs information to the computer in a one-way fashion. A Chinese character input method developed according to the above ideal has already been successfully tested at the Beijing Municipal Institute of Computer Technology.

The encoding set of this new computer-assisted Chinese character input method includes 11 Chinese characters of the highest frequency usage, 9 punctuation

marks, 9 basic strokes, and 60 character components which can be used to make up characters. In all there are 89 character elements.

The method is used in this way: 1) The character element is written on a key on a small general purpose keyboard. 2) The character elements are entered following the principles of top before bottom, left before right, outside before inside. 3) Each character requires that no more than 5 character elements be keyed in. 4) Characters which cannot be determined by 5 keys are duplicate code characters. They are displayed in a row on the CRT and one key carries out a second search. Duplicate code characters make up about 12.4 percent of the GB [?] character stock. 5) Characters which can be determined by 5 or fewer strokes are non-duplicate code characters and make up about 87.6 percent of the GB [?] character stock.

The important features of this Chinese character input method are:

1. There are no rigid principles so it is easy to learn and easy to use.

2. Using such editing functions of the BCT-4 Chinese character editing software as copying or exchanging words, sentences, and paragraphs can improve the speed of CAI code input and reduce the number of keystrokes, since the average length of the code is 3 elements.

8226
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APPLIED SCIENCES

BRIEFS

CHINESE READ/WRITE HEAD--When the Electronic Computer Center of the Shanghai Railway Bureau had a breakdown of an imported TE16 magnetic tape recorder, they used a model CT092C precision, 9-track read/write head produced by the Mudanjiang Magnetic Head Plant, and successfully connected them together in November, 1983. Over a month of testing in use showed that the tape recorder was functioning normally and that the performance of domestically produced magnetic head was superior. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 8 Feb 84 p 7] 8226

CSO: 4008/166

LIFE SCIENCES

NATIONAL MEETING ON PHARMACEUTICAL LAW ENDS

OW201355 Beijing XINHUA Domestic Service in Chinese 1648 GMT 15 Jun 85

[Text] Beijing, 15 Jun (XINHUA) -- At the national conference on implementation of the pharmaceutical administration law which concluded today, Chen Minzhang, vice minister of public health, urged departments in charge of health administration at all levels to conscientiously undertake the tasks entrusted by the state in implementing the "Pharmaceutical Administration Law." He stressed the need to strengthen awareness of the legal system and to adhere strictly to the law in handling matters.

He said: "It is necessary to have a thorough understanding of the dialectical relationship between reform, opening to the outside world, enlivening the economy, supervision, and management in carrying out the "Pharmaceutical Administration Law." Experience based on the country's pharamceutical administration and control work since the founding of the PRC has shown that: "Where there are laws, there is order; where there are no laws, there is confusion." The "Pharmaceutical Administration Law" approved by the NPC Standing Committee further sums up and improves on the regulations on the supervision and control of medicines making these regulations more systematic, orderly, and legalistic. At the same time, clear-cut regulations are provided regarding the production and therapeutic uses of pharmaceuticals; sales; examination and approval of new medicines; advertising; quality requirements; supervision and inspection, as well as legal responsibility. These are of great significance to raising the quality of pharmaceuticals, promoting their production, and ensuring the safety and efficacy of medical application.

He asked departments in charge of health administration at all levels to live up to the state's expectations, thoroughly understand the complications involved in enforcing this law, and not to fear hardships. They must bear in mind their responsibilities to the party and to the people's health, and ensure the smooth implementation of the "Pharmaceutical Administration Law" by acting according to regulations, using the law as the yardstick and facts as the basis, and pin down the legal responsibility of law breakers.

He pointed out: Leading cadres of public health bureaus in all provinces, municipalities, and autonomous regions must look on law enforcement work as a major task and consider it an important item of the agenda. They must lose no time in mapping out strategies connected with duties, demands, and measures in law enforcement, and seriously investigate cases of violation. They must also

earnestly resolve difficulties and problems encountered in actual work, as well as provide necessary support and guarantee funding for drug administration and supervision.

Finally, he pointedly emphasized: "Augmenting law enforcement offices and personnel is the organizational guarantee to implementing the "Pharmaceutical Administration Law." Hence, it is imperative to enhance the law enforcers' political consciousness and understanding of policies, as well as raise their technical and managerial levels. They must enforce the law impartially, observe strict discipline, adhere to principles, and be honest in performing official duties. They must never practice favoritism, fraud, or graft. Law enforcers must resolutely combat all kinds of unhealthy practices. Those who knowingly violate the rules must be severely punished. It is necessary to reinforce ideological and political education in order to establish a contingent of law enforcement officers with high ideals, moral values, strict discipline, and tough work style.

The national conference on implementing the "Pharmaceutical Administration Law" lasted for 4 days, and was attended by some 200 responsible persons and delegates of concerned departments from all provinces, autonomous regions, and municipalities throughout the country.

The meeting also exchanged experiences in studying, publicizing, and implementing the "Pharmaceutical Administration Law." It also conducted serious discussions on ways to tighten supervision and control over pharmaceuticals.

CSO: 4008/2020-F

LIFE SCIENCES

TIANJIN COMPANY PREVENTS FAKE PHARMACEUTICALS

OW181351 Beijing XINHUA Domestic Service in Chinese 0238 GMT 14 Jul 85

[By reporter Yan Jing and correspondent Yu Ling]

[Excerpts] Tianjin, 14 Jul (XINHUA) -- XINHUA editor's note: In our socialist country, there should normally be no markets for fake and defective pharmaceuticals, nor should such markets be allowed to exist. However, ignoring ethics for profits, some units and individuals have flagrantly engaged in these undertakings, thus endangering people's lives and violate public morals. This is legally and morally impermissible. Tianjin's experience proves that such a problem is not really difficult to solve if only the departments and enterprises concerned conscientiously take actions to contain, track down, intercept, and seriously investigate fake and defective pharmaceuticals so that they cannot establish a foothold in the market and deceive people. (editor's note ends)

The Tianjin municipal pharmaceutical materials company has been able to eliminate footholds for fake and defective pharmaceuticals by carrying out strict measures in three aspects of work: procurement, inspection, and procurement personnel's discipline.

Each year, the company purchases more than 300 kinds of Chinese pharmaceutical products and more than 500 kinds of Chinese pharmaceutical materials with a total weight of more than 10 million jin from localities throughout the country. Nevertheless, fake or defective pharmaceutical materials or fake pharmaceuticals are rarely found in Tianjin's markets.

First, the Tianjin municipal pharmaceutical materials company has put more than 10 veteran pharmacists with 40 or 50 years of experience in handling Chinese pharmaceutical materials in charge of procurement quality. As result, very few fake or defective pharmaceutical materials can pass without being detected.

Second, to prevent loopholes, the Tianjin municipal pharmaceutical materials company has also established a strict, comprehensive system and carried out the system at all levels, thus intercepting the "escaping fish." Before entering the warehouse, all Chinese pharmaceutical materials purchased are inspected once again, and valuable ones undergo a joint inspection by the company's pharmaceuticals inspection section, administrative section, and pharmaceuticals warehouse. In taking delivery of goods at the warehouse, pharmaceutical stores and factories

have to have their goods undergo spot-checks at the exit before they are released from the warehouse. Another spot-check of pharmaceutical materials is carried out before they are processed into products or sold by the pharmaceutical factories or stores.

The Tianjin municipal pharmaceutical materials company has carried out a strict discipline, reward, and punishment system among the personnel it sent to localities throughout the country to purchase Chinese pharmaceutical products. All purchases of Chinese pharmaceutical products are made in accordance with plans formulated by the company. No procurement personnel has the power to unscrupulously purchase pharmaceutical products outside of plan. Procurement of any pharmaceutical products that lack approval numbers or registration marks is clearly prohibited.

CSO: 4008/2020-F

LIFE SCIENCES

BRIEFS

XIZANG IMPROVES MEDICAL SERVICES -- According to the date of a recent investigation, China has invested over 340 million yuan in Xizang's medical services from 1965 to 1984. The number of medical institutions increased from 193 to 927, or by 380 percent. The number of beds increased from 1,631 to 4,738 or by 190 percent. The number of medical experts increased from 2,422 to over 6,720, or by 180 percent, of whom 59 percent are Zang and other minority nationalities. Xizang's present population is 1.96 million, of which 87 percent are peasants and herdsmen. In this year, the growth rate of medical institutions and staff numbers in the rural areas is greater than those in the urban areas. On average, each medical expert in Xizang serves an area of 178 square kilometers; whereas the nation's average figure is only three square kilometers. [Summary] [Lhasa Xizang Regional Service in Mandarin 1300 GMT 27 Jun 85 HK] 5357

BEIJING HEALTH WORK -- Thus far, in Beijing City, the average life expectancy has risen from 53.9 years in 1949 to 72.5 years, and that of woman from 50.2 to 75.4 years. The number of the people who died from epidemic diseases used to rank first in total deaths, but it now ranks 10th. The incidence of such epidemic diseases as diphtheria, pertussis and type-B encephalitis has dropped by 94 percent compared with 1960. Great achievements have also been won in the prevention and treatment of gynecological diseases. General checkups and treatment have been carried out for 2 million women over the past 10 years. The incidence of cervix cancer has declined from 111.4 per hundred thousand in 1974 to 7 per hundred thousand. [Excerpts] [Beijing City Service in Mandarin 1000 GMT 8 Jun 85 SK]

CSO: 4008/2020-F

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

SOLID PROPELLANT ROCKET ENGINE ACADEMIC EXCHANGE CONFERENCE HELD IN QINGDAO

Beijing YUHANG XUEBAO [JOURNAL OF THE CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 2, 30 Apr 85 p 118

[Text] An academic exchange meeting was held 2-6 November 1984 in Qingdao, jointly sponsored by the Astronautics Academy's Solid Propellant Rocket Engine Industry Committee and the China Aeronautics Academy Motive Power Equipment Industry Committee.

There were 112 attendees from 51 units representing institutes, technical and production offices, national defense technical industries, ministries of space industry, aviation industry and the military and chemical industries. Experts, technicians, and researchers of all ages were included.

Eighty-one papers were presented covering the categories of engine design, interior ballistics, combustion experimental technology, and computed mechanics.

The following points were made regarding present and future work:

1. Academic exchange is an important job, but we must hold fast to the revolutionary spirit and hold more joint meetings. Important work must be carried out, in group meetings, using varied formats, with papers presented with demonstrations and vocal exchanges.

2. Use appropriate methods to gear the academic exchanges to reality and carry out international-level programs.

3. Propose that concerned units hold working meetings on special subjects regarding how to resolve actual questions of scientific research and production.

4. Prevent duplication in academic exchanges by properly coordinating the study activities of each institute, scientific research and production unit.

5. Regarding participant development, for those many places without local astronautics institutes, the method of the military industries can be emulated to allow specialized industrial committees to achieve development through academic exchanges.

Aside from this, committee members presented ideas on funding, urging the full support of academic and other concerned units.

Regarding specific arrangements for future work, it was decided to hold a consolidated academic exchange meeting in 1985. The 83 year advance plan is to be arranged as usual at the 1985 propellant science academic exchange meeting.

CSO: 4008/373

AUTHOR: BAI Yuhai [4101 3768 3189]

ORG: Institute of Acoustics, Academia Sinica

TITLE: "Superconducting Phonon Detector for the Detection of High-frequency Phonons"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 137-142

TEXT OF ENGLISH ABSTRACT:

Some self-built superconducting phonon detectors have been used to detect wide-band high-frequency phonon signals in X-quartz and (001)-GaAs samples. High purity Sn is used as the material of the superconducting film with a thickness of about 800 Å. The voltage responsivity of a typical detector is 190 V/W, NEP 10^{-14}WHz$^{-1/2}$, the rise-time 10 nS and the dynamic range 46 dB. This kind of detector is useful not only for the detection of wide-band as well as of coherent phonons, but also for the detection of heat pulses and FIR signals.

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12949
CSO: 4009/1064

Applied Mathematics

AUTHOR: GAI Bingzheng [4164 4426 2398]

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TITLE: "On the Structure of Solutions of Linear Partial Differential Equation $\Sigma a_{ij}p^iq^j\varphi = 0$ With Two Independent Variables and Constant Coefficients"

SOURCE: Chongqing YINGYONG SHUXUE HE LIXUE [APPLIED MATHEMATICS AND MECHANICS] in Chinese Vol 6 No 5, May 85 p 445

ABSTRACT: This paper is a continuation of [1]. In this paper, the solutions of the more general linear partial differential equation $\sum_{i+j\leqslant n} a_{ij}p^iq^j\varphi = 0$ with two independent variables and constant coefficients are discussed in detail. The general solution which can be used in the approximation to the conditions of the definite solution of the practical problems is presented. To illustrate the use of the results obtained in this paper, some practical examples in mechanics are given.

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CSO: 4009/1070

AUTHOR: LIU Changtai [0491 7022 2504]

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TITLE: "Composition of Composites"

SOURCE: Chongqing YINGYONG SHUXUE HE LIXUE [APPLIED MATHEMATICS AND MECHANICS] in Chinese Vol 6 No 5, May 85 p 463

ABSTRACT: For a special material needed in engineering, it would be most ideal if it can be predicted on the basis of a certain theory. For this purpose, the author wants to investigate a proper theory and select a few materials to make a composite which is consistent with the object material given beforehand. In this paper, the theory is given in the first three parts, and the results are given in the fourth part. Theoretical calculations were made for the composites of the two object materials given in engineering. Composites are made according to the results of the calculations, and tested on. The results obtained are satisfactory.

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CSO: 4009/1070

JPRS-CST-85-026
15 August 1985

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TITLE: "A Convexity-Preserving Interpolation for Smooth Functions"

SOURCE: Beijing JISUAN SHUXUE [MATHEMATICA NUMERICA SINICA] in Chinese Vol 7, No 1, Feb 85 pp 24-28

TEXT OF ENGLISH ABSTRACT: For a spline interpolation problem of the general smooth function, if we write $\delta^2 y_i$ for second difference coefficient, and c_i for second derivative of the second spline function s(x) at $[x_{i-1}, x_i]$, then the sufficient and necessary conditions of convexity-preserving interpolation for the s(x) at [a, b] are:

1. $\delta^2 y_1 \cdot c_1 \geqslant 0$;
2. $\delta^2 y_{n-1} \cdot c_n \geqslant 0$;
3. when $\delta^2 y_{i-1} \cdot \delta^2 y_i > 0$ $(i \in \{2,3,\cdots\cdots,n-1\})$, there is $\delta^2 y_i \cdot c_i \geqslant 0$.

(Paper received on 23 Oct 82)

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AUTHOR: DENG Jianxin [6772 0256 2450]

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TITLE: "An Improvement on Bendixson's Theorem for an Eigenvalue Problem of a Matrix"

SOURCE: Beijing JISUAN SHUXUE [MATHEMATICA NUMERICA SINICA] in Chinese Vol 7, No 1, Feb 85 pp 103-105

TEXT OF ENGLISH ABSTRACT: The Bendixson's theorem shows that all the eigenvalues of a matrix A lie in a rectangle of the complex plane with four edges defined by the extreme eigenvalues of matrices $B=\frac{1}{2}(A+A^H)$ and $C=\frac{1}{2}(A-A^H)$. In this paper, some more delicate bounds for each eigenvalue of A, denoted by the eigenvalues of B, C and the departure from normality of the matrix A, have been given. (Paper received on 22 Mar 84)

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TITLE: "The Continuity of the Rational Interpolating Operator"

SOURCE: Beijing JISUAN SHUXUE [MATHEMATICA NUMERICA SINICA] in Chinese Vol 7, No 1, Feb 85 pp 106-111

TEXT OF ENGLISH ABSTRACT: Let P/Q be an (m/n) quasi-rational interpolant for the given interpolating data (F, Z). Let T_{mn} be the operator that maps (F, Z) on P/Q. It is known that the sufficient condition for T_{mn} to be continuous at (F, Z) in the ordinary sense is $\partial(p)=m$.

In this paper we prove that T_{mn} is spherically continuous at (F, Z) if and only if P/Q has a defect zeros. A weakened conclusion about the continuity of T_{mn} is also given when P/Q has positive defects. (Paper received on 23 May 84)

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CSO: 4009/1060

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TITLE: "The Radial Shapes of Intermediate Energy Microscopic Optical Potentials"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 6, No 4, Nov 84 pp 289-296

TEXT OF ENGLISH ABSTRACT: The radial shapes of intermediate energy proton microscopic optical potentials of ^{40}Ca are calculated with nuclear matter approach by Skyrme interactions. The calculated results show that the real central potential in central region of nucleus changes from attractive to repulsive when the energy of incident nucleon is above $\sim$150 MeV and appears to be a "wine-bottle-bottom" shape in the transition energy region (from 150 MeV to 300 MeV). This tendency is consistent with emprical optical potential obtained through fitting experiments and microscopic optical potential calculated with relativistic mean field theory as well as with the BHF theory. The calculated imaginary part of the volume absorption and its absolute value become larger as energy increses. The effects of Skyrme force parameters to the radial shape of the calculated microscopic optical potential are analysed in detail.

12949
CSO: 4009/215

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TITLE: "Total Photon Cross Section Measurements for Some Metals at E_γ=7.28 MeV"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 6, No 4, Nov 84 pp 334-341

TEXT OF ENGLISH ABSTRACT: The total photon cross sections with Al, Mg, Fe, Ni, Cd, Sn, and Bi are measured at E_γ=7.28 MeV. The γ ray comes from resonance scattering of γ rays on Pb for Fe(n,γ) reaction. The standard errors of the measured values are about $\pm$ 1 percent. The measured results are compared with the calculated values.

12949
CSO: 4009/215

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ORG: Institute of Atomic Energy, Academia Sinica, Beijing

TITLE: "Measurement of Fission Cross Section for ^{237}Np Induced By Fast Neutron"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 6, No 4, Nov 84 pp 369-372

TEXT OF ENGLISH ABSTRACT: The fission cross section of ^{237}Np is measured in the neutron energy range 4.0-5.5 MeV using a recoil proton semiconductor detector telescope and fission ionization chamber placed back-to-back system. The errors and corections of the results are discussed. The results obtained are compared with the ENDF/B-V data.

12949
CSO: 4009/215

JPRS-CST-85-026
15 August 1985

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ORG: None given

TITLE: "On the Impedance Matching of the Biconical Sampler"

SOURCE: Lanzhou LANZHOU DAXUE XUEBAO (ZIRAN KEXUE BAN) [JOURNAL OF LANZHOU UNIVERSITY (NATURAL SCIENCE EDITION)] in Chinese Vol 20, No 2, 28 Jun 84 pp 49-57

TEXT OF ENGLISH ABSTRACT: It is well known that the biconical sampler is an ultra-wideband sampling device. But owing to the introduction of the sampling diodes into the sampler, its transmission and sampling characteristics are seriously deteriorated. In order to eliminate the disadvantageous effect of the sampling diodes, a compensator is built in the centre of the sampler. The impedance matching effect of the compensator is one of the keys to the realization of the ultra-wideband performance of the sampler. The present paper, on the basis of theoretical analysis, presents formulas for engineering design of the compensator. Experiments show that the theory here tallies with the test results.

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CSO: 4009/1063

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TITLE: "An Application of Harmonic Analysis Method To Establish the Mathematical Model of Camelback Shaped Curve in Metal Cutting"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese Vol 15, No 1, 20 Jan 85 pp 21-32

TEXT OF ENGLISH ABSTRACT: It is shown that the Taloy's formula is effective only in a narrower range of cutting. If the test is made in a wide range of speed, the V-T curve obtained is not always in a monotonic functional relation, but sometimes becomes a camelback shaped form practically. On the basis of the principle of harmonic analysis, this article presents a method for establishing the mathematical models of the camelback curve. Taking the V-T and the V-F_z relationships for examples, procedures to apply this method is introduced. It is shown that the calculated values are well agreed with the experimental results. Finally, the scheme of the computer programs based on harmonic analysis method is given. (Paper received on 16 Apr 84)

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ORG: Department of Mechanical Engineering

TITLE: "A Study on Fracture Toughness of Boss Steel"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese Vol 15, No 2, 20 Apr 85 pp 9-18

TEXT OF ENGLISH ABSTRACT: Through the inductive method the author suggests a new relationship between fracture toughness and normal mechanical behavior of large section structure steel. For predicting the reliability, tests have been taken for more than 150 samples after various kinds of heat treatments. At the same time, the new formula has also been applied to industry, such as turboalternator rotor, tail shaft of submarine, locomotive boss etc. Through more than eight years running practice, it has proved that the new formula is reliable. (Paper received on 24 Sep 84)

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TITLE: "Design of Linear Predictive Vocoder With Bit-Slice"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese Vol 15, No 2, 20 Apr 85 pp 49-56

TEXT OF ENGLISH ABSTRACT: An overall design scheme of practical vocoder is presented. Its distinguished features are as follows: (1) Extraction of vocal tract parameters: An improved "covariance-lattice" linear predictive method is selected. (2) Extraction of pitch period: An inverse filtered-simplified-AMDF method is proposed. (3) Parametric coding and speech synthesis: Nonuniform optimal coding for vocal tract parameters and logarithmic coding for pitch and gain are suggested. Acoustic-tube modeling synthesis by using slopping-triangle or pseudo-random number exciting signal is employed. (4) Hardware realization: A system which mainly consists of a bit-slice microprocessor and a hardware multiplier is recommended. (Paper received on 7 Jul 84)

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TITLE: "Calculation for Crack Width of Reinforced Concrete Members With Flexure"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese Vol 15, No 2, 20 Apr 85 pp 64-72

TEXT OF ENGLISH ABSTRACT: In this paper, on the basis of the calculation model on crack width, which is presented by the second author and adapted in China Code TJ10-74, a new formula for calculating crack width is suggested. In this formula, the effect of thickness of concrete cover of steel bars is taken into account for calculating the average crack distance, and the stress in steel under tension is regarded as parameter when calculating the non-uniformity coefficient of steel strains. Moreover, the magnification coefficient of crack width is calculated according to the probability distribution of crack width.

The formula is more simple, and the values calculated by it accord with the results of experiments better. The formula will be put in China Code TJ10-85. (Paper received on 12 Mar 84)

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TITLE: "Influences of Gamma Irradiation on Mobile Ions in MOS Structure"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese Vol 15, No 2, 20 Apr 85 pp 96-102

TEXT OF ENGLISH ABSTRACT: In this paper the change of energy and amount of mobile ions in SiO_2 film of MOS structure undergone γ-rays irradiation had been studied with TSIC and B-T techniques. The results show that the most probable energy of mobile ions traped in SiO_2 film decreases, and the amount of ions also greatly reduces. Experimental results had been explained by means of built-in field enhanced ion emission and ion neutralized models. Calculations show that the theoretical results coincide well with that obtained from the experiments. (Paper received on 17 Aug 84)

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CSO: 4009/1058

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TITLE: "A High Resolution Sea Surface Temperature Field Derived from AVHRR Infrared Window Radiation Measurements"

SOURCE: Beijing HAIYANG KEXUE [JOURNAL OF MARINE SCIENCE] in Chinese No 3, 9 May 85 p 9

TEXT OF ENGLISH ABSTRACT: A procedure of deriving high resolution sea surface temperature field from digital AVHRR/HRPT data is described in this paper. For the purpose of reducing the processing time, only the reflectivity threshold of near infrared channel is used for selecting data over clear area of ocean, and W.L. Smith single window channel sea surface temperature retrieval method is used for atmospheric attenuation correction for the area of Beihai Bay and Yellow Sea during the cold half of year. Comparing with other measurements the result is quite satisfactory.

12949
CSO: 4009/2002

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TITLE: "Exciton Model Calculation of Inelastic Scattering Induced By 25.7 MeV Neutron"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 6, No 4, Nov 84 pp 315-321

TEXT OF ENGLISH ABSTRACT: The inelastic scattered neutron spectra and angular distributions of 25.7MeV neutron by ^{51}V, ^{56}Fe, ^{65}Cu, ^{93}Nb and ^{209}Bi are calculated theoretically with the exciton model of pre-equilibrium reaction. The calculated results are compared with the experimentally measured data in the region of neutron energy of 12-17 MeV. The simple exciton model gives good fits of inelastic scattered neutron spectra, but the fits of angular distributions are worse, particularly in the region of large angles. The fits are improved obviously when more suitable initial conditions of angular distributions are used in the master equation.

12949
CSO: 4009/215

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TITLE: "Isometric Cross-section Ratio for ^{198}Pt (n, 2,n) Reaction Induced By 14.8 MeV Neutrons"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 6, No 4, Nov 84 pp 373-377

TEXT OF ENGLISH ABSTRACT: The cross-section and cross-section ratio of ^{197}pt isomers produced in the ^{198}Pt (n, 2n) reaction are measured at 14.8 MeV neutron energy. Using the Huizenga Vandenbosch method, theoretical calculations of isomeric cross-section ratio is completed. The value measured experimentally is compared with the theoretical calculations and prediction is made for the nuclear spin density parameter σ which characterizes the nuclear level density on angular momentum.

12949
CSO: 4009/215

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TITLE: "Theory of Critical Temperature in Magnetic Superconductors"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 85-92

TEXT OF ENGLISH ABSTRACT:

The theory developed in [1] is generalized to include magnetic superconductors. The suppresive effect of spin fluctuation on the superconducting transition temperature has been studied. A series form of T_c formula is given as follows:

$$T_c = \sqrt{\lambda\langle\omega^2\rangle}\left\{b_0 + \frac{1}{\lambda}\left[b_4\frac{\langle\omega^4\rangle}{\langle\omega^2\rangle^2} + b^2\frac{(\omega^2)}{\langle\omega^2\rangle}\right] + \frac{1}{\lambda^2}\left[b_6\frac{\langle\omega^6\rangle}{\langle\omega^2\rangle^3} + b_{44}\frac{\langle\omega^4\rangle^2}{\langle\omega^2\rangle^4} + b_4^2\frac{\langle\omega^4\rangle(\omega^2)}{\langle\omega^2\rangle^3} + b^{22}\frac{(\omega^2)^2}{\langle\omega^2\rangle^2} + b^4\frac{(\omega^4)}{\langle\omega^2\rangle^2}\right] + O(\lambda^{-3})\right\}$$

where the coefficients $b_0, b_4, b^2\cdots$are only functions of the coulomb psudo-potential μ^*, and $\langle\omega^{2n}\rangle$, (ω^{2n}) are moments of effective phonon spectrum $\alpha^2F(\omega)$ and paramagnon spectrum $\alpha_m^2F(\omega)$ respectively. Futhermore, the comparisons of the T_c formula with the exactly numerical solutions have also been made.

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12949
CSO: 4009/1064

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TITLE: "Superconductivity of Metallic Glasses $(Cu_{1-x}Ni_x)_{33}Zr_{67}$"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 93-98

TEXT OF ENGLISH ABSTRACT:

Superconductivity of metallic glasses $(Cu_{1-x}Ni_x)_{33}Zr_{67}$ series has been investigated in the present paper. Critical temperature T_c, upper pependicurler critical field H_{c2} and other physical parameters have been measured. The results show that these metallic glasses belong to weak-coupling superconductivity. T_c increases with the increase of Ni concentration. $N(O)$, the density of state at Fermi level, has been estimated by $(dH_{c2}/dT)_{T_c}$. Varma-Dynes parameter δ is roughly a constant. Higher $N(O)$ corresponds to higher T_c. In conclusion, $N(O)$ is a basis parameter governing superconductivity.

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12949
CSO: 4009/1064

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TITLE: "The Effects of Self-field in Circular Symmetric Tunnel Junctions and the Stability of the Solutions"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 99-107

TEXT OF ENGLISH ABSTRACT:

The effects of self-field on the current distribution in circular symmetric tunnel junctions have been discussed in this paper. Approximate analytic solutions of current and magnetic field distribution and the critical current are obtained when the radius of the junction is very small. The critical current is proportional to the radius when the radius of the junction is rather large. In most cases the numerical calculations are presented. For the given bias current, which is less than the critical current, the solutions obtained from the self-field equations are not unique. The stability of the solutions have also been discussed.

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12949
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TITLE: "The Dependence of the Surface Superconductivity on the Probable Constrained Effective Density Distribution of the Cooper Pairs"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 108-116

TEXT OF ENGLISH ABSTRACT:

The density of the cooper pairs moving in a steady magnetic field has a probablest distribution in space. The boundary effects for a superconductor-vacuum interface or for a superconductor-insulator interface impose restrictions on this distribution and vary the distribution of the effective potential. As a result the effective potential energy near the interfaces is lowered and therefore the superconducting surface sheath appears. The width of the surface sheath nonlinearly increases as the field decreases. The third critical magnetic field of a superconducting slab in a parallel field has been easily obtained by means of these constrained distributions.

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12949
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TITLE: "Critical Currents and Pinning Mechanism of Superconducting Nb-50wt%Ti Alloys"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 123-129

TEXT OF ENGLISH ABSTRACT:

The results of the transmission electron microscopy examination as well as critical current measurements at 4.2 K under the fields up to B_{c2} for Nb-50wt%Ti Multifilamentary wire optimized with multiple heat treatment and processing cycles are presented in this paper. The pinning mechanism of the optimized samples has been discussed to a great extent with respect to these results, demonstrating the theoretical basis for the optimization process. In order to improve the J_c of Nb-50wt%Ti alloys under high field further, it is necessary to control the flux shear motion at high fields besides that both the fine-scale sub-band and α-Ti precipitates.

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12949
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TITLE: "Analysis of Jc (H) Measurements With Pulse Magnetic Field"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 143-151

TEXT OF ENGLISH ABSTRACT:

While measuring the high field parameters of small resistance Nb_3Sn samples, we found the real signal was concealed completely by the disturbance signal. We analysed the measurements and made theoretic calculations, finding the reason why there existed a great disturbance signal. After eliminating this disturbance signal, the real signal was still concealed by the background noise. Methods to get the real signal from the background noise have been obtained.

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12949
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TITLE: "The Influence of Exchange Interaction Between Electrons on the Superconducting Transition Temperatures"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 152-156

TEXT OF ENGLISH ABSTRACT:

It is well known that exchang interaction between electrons is destructive to superconductivity through the spin fluctuation coupling effect. Recently, D. J. Kim pointed out that by softening phonons the exchange interaction between electrons enhanced the electron-phonon coupling constant λ and rendered a positive effect on superconductivity. The present paper gives a quantitative estimation of the influence of exchange interaction between electrons upon the superconducting transition temperatures.

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12949
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TITLE: "Optimum Inlet Temperatures for Expansion Engines in Collins Helium Liquifiers"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 7, No 2, Jun 85 pp 157-163

TEXT OF ENGLISH ABSTRACT:

A method for calculating optimum inlet temperatures of expansion engines in Collins helium liquifiers is presented. The optimum inlet temperatures of expansion engines for different inlet pressure and precooling temperature have been calculated. So has the influence of the efficiency of the expansion engine and the heat exchanger on optimum inlet temperatures for the engine.

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12949
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TITLE: "A Linear Theory for Beam Transport with an Arbitray Profile in the Phase Space"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 6, No 4, Nov 84 pp 354-362

TEXT OF ENGLISH ABSTRACT: A generalized linear theory for beam transport with an arbitray profile in the phase space is described. Envelope equations for the upside beam and downside beam are given. Expressions for waist to waist transport in a phase space with centrosymmetry are derived. It can be seen from the examples given that this theory is not only more general but also more flexible than the conventional theory with an elliptical profile in the phase space.

12949
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END